AD NUMBER

AD001009

NEW LIMITATION CHANGE

TO

Approved for public release, distribution unlimited

FROM

No foreigh distribution.

AUTHORITY

ONR notice., 1 Sep 1970

AD-

1009

UNCLASSIFIED

U. S. Naval School of Aviation Medicine

U. S. NAVAL AIR STATION
PENSACOLA, FLORIDA

RESEARCH REPORT

THE DEVELOPMENT AND TRYOUT OF OBJECTIVE CHECK FLIGHTS IN PRE-SOLO AND BASIC INSTRUMENT STAGES OF NAVAL AIR TRAINING

JOINT PROJECT REPORT

THE PSYCHOLOGICAL CORPORATION, NEW YORK, NEW YORK
AND
U.S. NAVAL SCHOOL OF AVIATION MEDICINE, PENSACOLA, FLA.

PROJECT NO. NM 001 058.24.01

BASIC INSTRUMENT CHECK

OBJECTIVE TYPE

EXPERIMENTAL FORM

Student's Name

Instructor's Name

Flight No. Date

Period of Flight Day of Week

CALIBRATION OF INSTRUMENTS
INSTRUCTOR'S vs. STUDENT'S

STUD. ALT.	STUD. D.G.	STUD. SWEEP
AT EVEN 1000'S	AT 0° HDG.	AT 12 O'CLOCK
INSTRUCTOR'S	INSTRUCTOR'S	INSTRUCTOR'S
AT FT.	AT	AT

Prepared By

THE PSYCHOLOGICAL CORPORATION

and

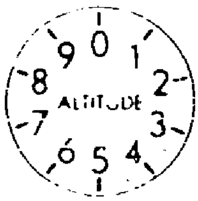
THE U. S. NAVAL SCHOOL OF AVIATION MEDICINE

TURN PATTERN

FIRST TURN 15 90	Maximum Deviations 9 0 1 2 3 4 5 6 7 8 ALTITUDE	Manner of Correcting Altitude prompt / slow / never smooth / uneven / rough
	Bank Error	within 5 / 5 to 10 / over 10
REVERSAL	Heading when wings level	12 · 9 · 6 30 29 28 27 26 25 24
SECOND TURN 15 90	Maximum Deviations 9 0 1 2 3 4 5 6 7 8 ALTITUDE	Manner of Correcting Altitude prompt / slow / never smooth / uneven / rough
	Bank Error	within 5 / 5 to 10 / over 10
REVERSAL	Heading when wings level	3 2 1 0 35 34 33

THIRD TURN
30 -180

Maximum Deviations



Manner of Correcting Altitude

prompt		smooth	
slow		uneven	
never		rough	

Bank Error

within 5	5 to 10	over 10

REVERSAL

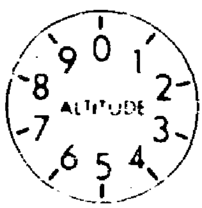
Heading when wings level

Lead
10
5 to 15
more than 15
less than 5

Coordination
½ ball or less
½ ball to 1 ball
over 1 ball

FOURTH TURN
30 -180

Maximum Deviations



Manner of Correcting Altitude

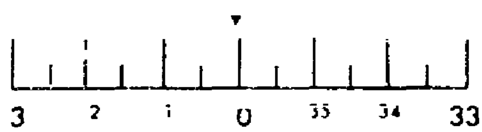
prompt		smooth	
slow		uneven	
never		rough	

Bank Error

within 5	5 to 10	over 10

REVERSAL

Heading (when wings level)



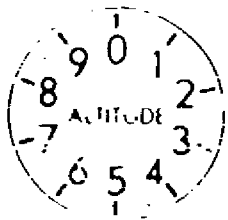
Lead
:10
5 to 15
more than 15
less than 5

Coordination
½ ball or less
½ ball to 1 ball
over 1 ball

TP 2

FIFTH TURN
45 360

Maximum Deviations



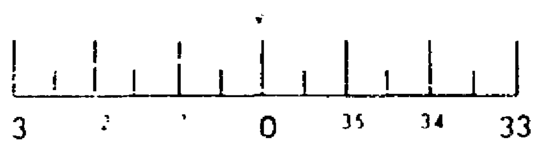
Manner of Correcting Altitude

prompt		smooth	
slow		uneven	
never		rough	

	within 5	5 to 10	over 10
Bank Error			

REVERSAL

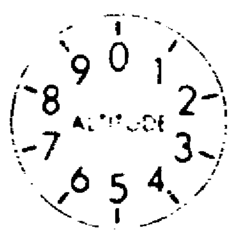
Heading when wings level



Lead	Coordination
15	½ ball or less
10 to 20	½ ball to 1 ball
more than 20 / less than 10	over 1 ball

SIXTH TURN
45 360

Maximum Deviations



Manner of Correcting Altitude

prompt		smooth	
slow		uneven	
never		rough	

	within 5	5 to 10	over 10
Bank Error			

REVERSAL

Heading when wings level

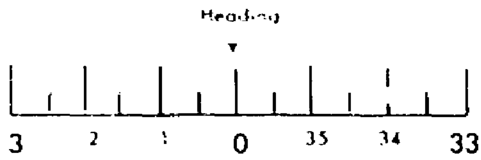
Lead	Coordination
15	½ ball or less
10 to 20	½ ball to 1 ball
more than 20 / less than 10	over 1 ball

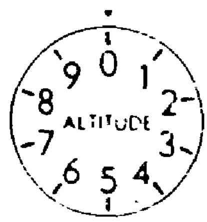
Calibrate Instruments Instructor's vs Student's	Student's Alt at even 1000's. Instructor's at ft	Student's D G at 0 heading Instructor's at	Student's sweep at 12 o'clock. Instructor's at

CHARLIE PATTERN

FIRST LEG

MAXIMUM DEVIATIONS





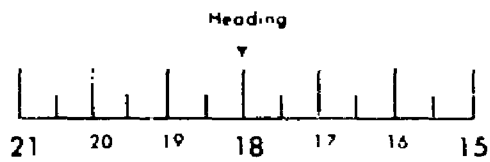
MANNER OF CORRECTING

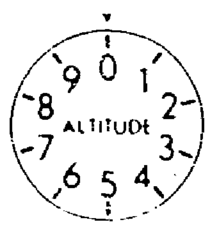
	Heading		Altitude	
	prompt	smooth	prompt	smooth
	slow	uneven	slow	uneven
	never	rough	never	rough

FIRST TURN
270 left

30 SEC
(6)

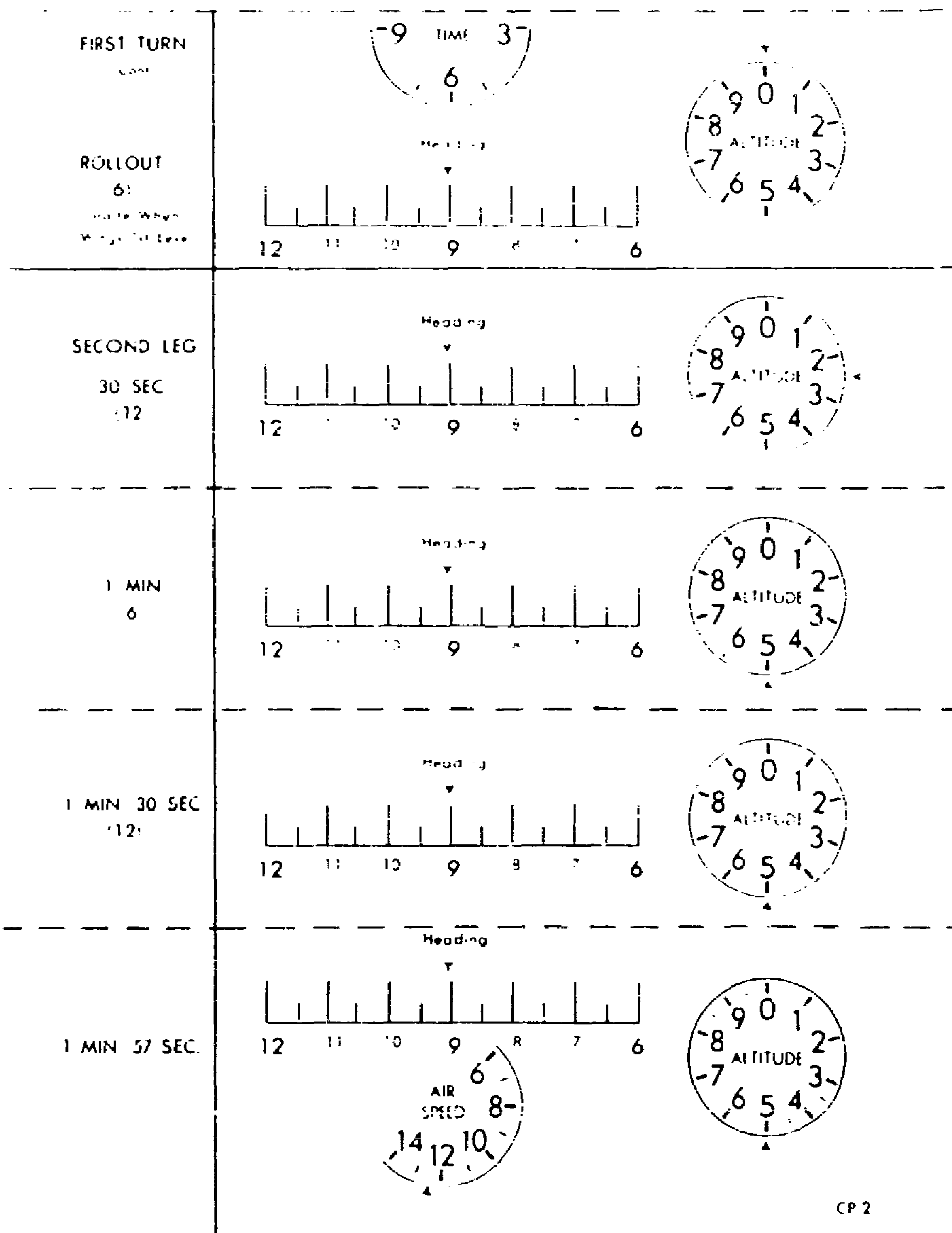
1 MIN
(12)





MANNER OF CORRECTING DURING 1ST MIN OF TURN

	Rate of Turn		Altitude	
	prompt	smooth	prompt	smooth
	slow	uneven	slow	uneven
	never	rough	never	rough



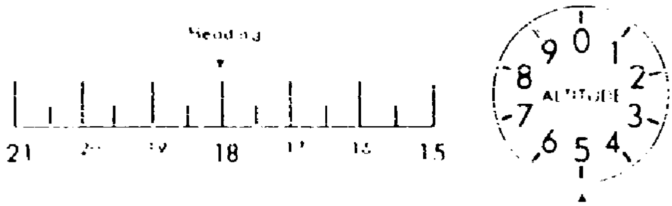
FIRST TURN
ROLLOUT
6
SECOND LEG
30 SEC
12
1 MIN
6
1 MIN 30 SEC
12
1 MIN 57 SEC.
TIME
Heading
ALTITUDE
AIR SPEED

CP 2

SECOND TURN

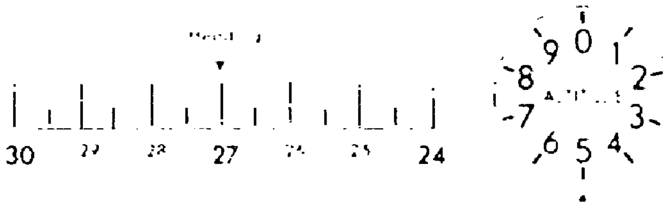
30 SEC

(12)



1 MIN

6

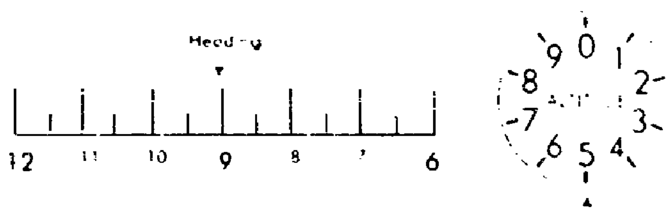


1 MIN 30 SEC

12

2 MIN

6

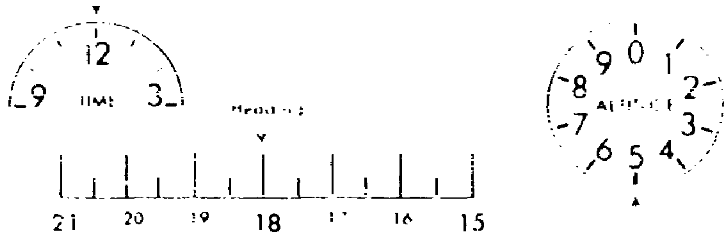


MANNER OF CORRECTING DURING SECOND TURN

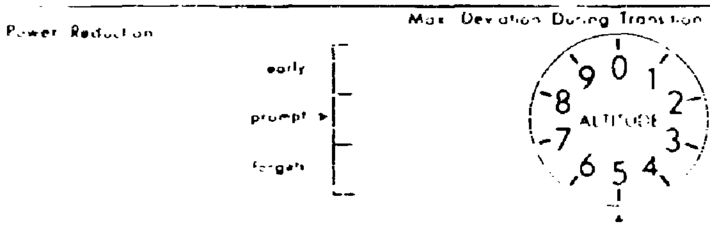
Rate of Turn		Altitude	
prompt [ ]	smooth [ ]	prompt [ ]	smooth [ ]
slow [ ]	uneven [ ]	slow [ ]	uneven [ ]
never [ ]	rough [ ]	never [ ]	rough [ ]

SECOND TURN

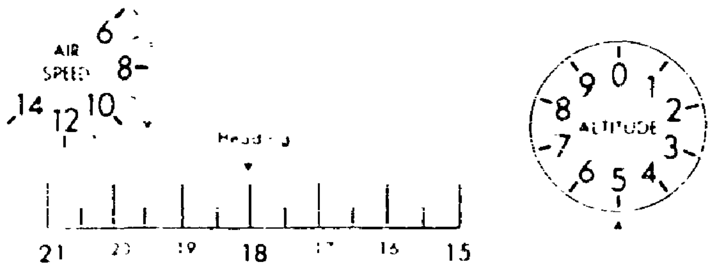
ROLLOUT



THIRD LEG TRANSITION

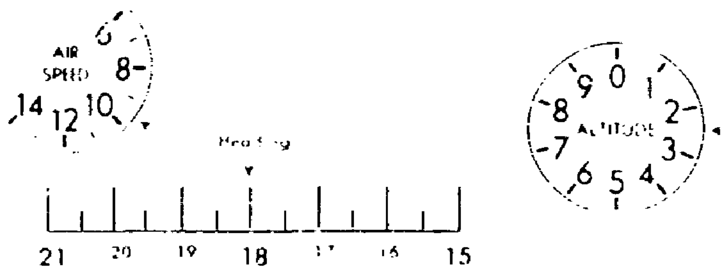


30 SEC



MIN

12

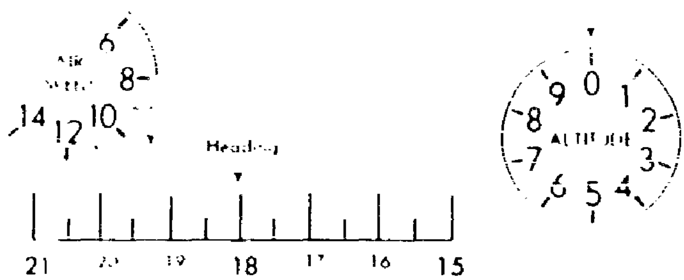


MANNER OF CORRECTING DURING DESCENT

Heading		Rate of Descent	
prompt	smooth	prompt	smooth
slow	uneven	slow	uneven
never	rough	never	rough

CP 4

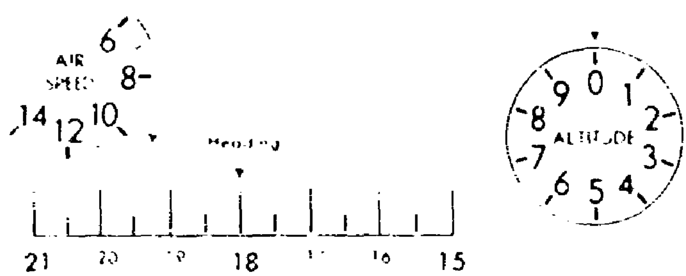
THIRD LEG
Cont
1 MIN 30 SEC
(6)



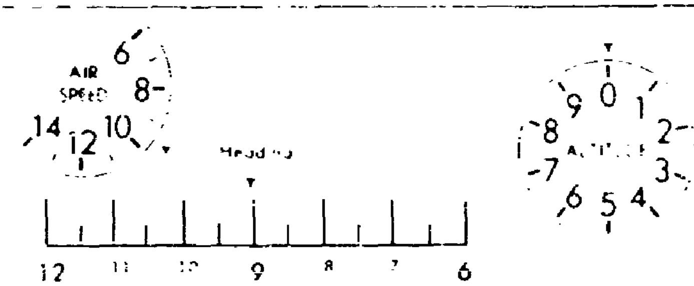
POWER ADDITION

prompt early late

1 MIN 57 SEC
(12)



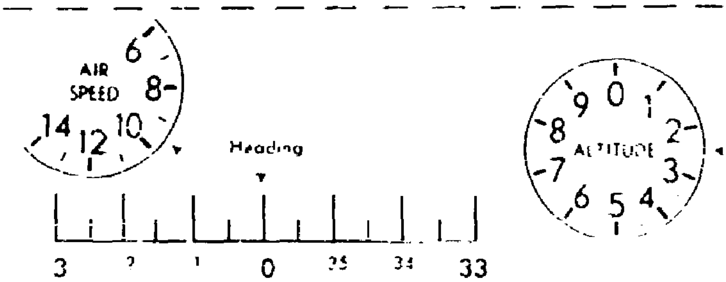
THIRD TURN
270 LEFT
30 SEC
(6)

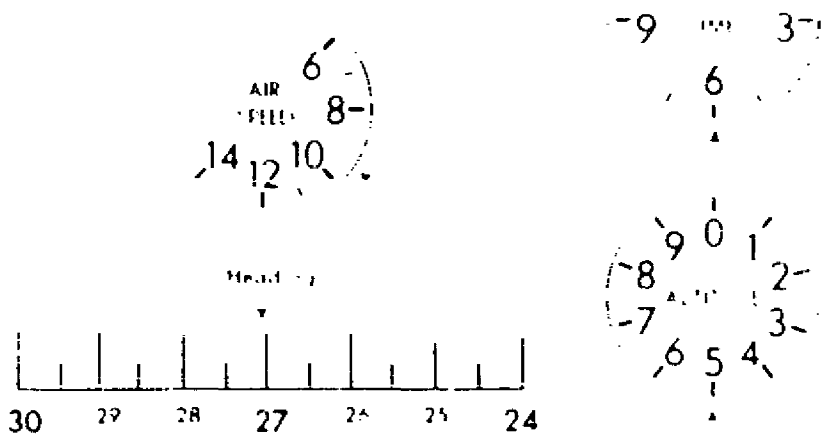
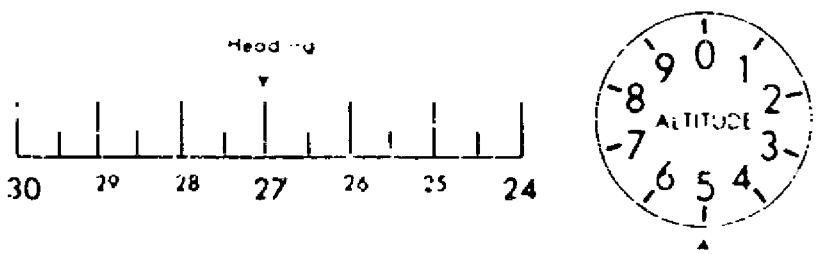


POWER ADDITION

prompt early late

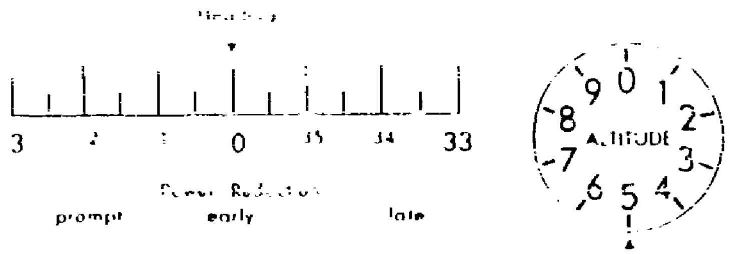
THIRD TURN
Cont
1 MIN
(12)



ROLLOUT (6)		
POWER REDUCTION		prompt early late
MANNER OF CORRECTING DURING THIRD TURN	Rate of Turn	Rate of Climb
	prompt [smooth [	prompt [smooth [
	slow [uneven [	slow [uneven [
	never [rough [	never [rough [
FOURTH LEG MAXIMUM DEVIATIONS		
MANNER OF CORRECTING DURING FOURTH LEG	Heading	Altitude
	prompt [smooth [	prompt [smooth [
	slow [uneven [	slow [uneven [
	never [rough [	never [rough [

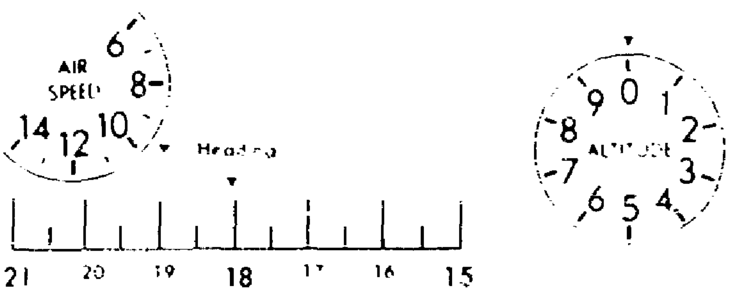
CP 6

FOURTH TURN
30 SEC.
(12)

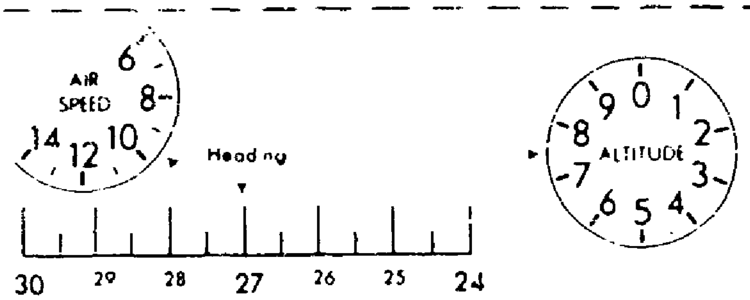


1 MIN
(6)

1 MIN 30 SEC
(12)



2 MIN
(6)



MANNER OF CORRECTING DURING FOURTH TURN

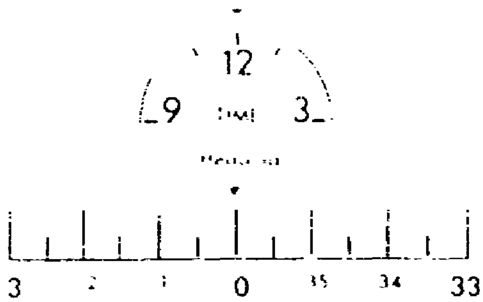
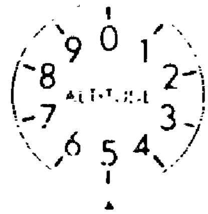
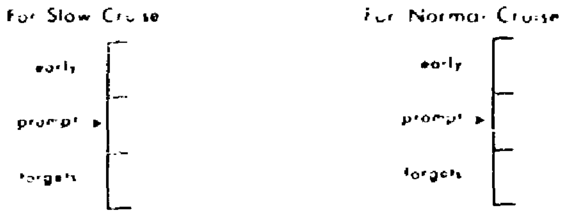
Rate of Turn

prompt	smooth
slow	uneven
never	rough

Rate of Descent

prompt	smooth
slow	uneven
never	rough

CP 7

ROLLOUT	 
POWER ADDITION	
MAXIMUM DEVIATIONS DURING LEVEL SPEED CHANGE	
CALIBRATE INSTRUMENTS INSTRUCTOR'S vs STUDENT'S	Student's Alt at even 1000's Instructor's at ______ ft · Student's D G at 0 heading. Instructor's at ______ · Student's sweep at 12 o'clock. Instructor's at ______
REMARKS ABOUT CHARLIE PATTERN	

UNUSUAL ATTITUDES AND PRACTICAL PROBLEM

CIRCLE L OR H TO INDICATE WHETHER U A IS NOSE LOW L OR HIGH H

	NOSE POSITION	L H	L H	L H	L H
	TRIAL	1st	2nd	3rd	4th
1st POWER CHANGE (If Needed)	proper improper				
INITIAL WING ADJUSTMENT	smooth & positive under corrects over corrects uses elevator pressure ►				
INITIAL NOSE ADJUSTMENT	smooth & positive under corrects over corrects steepens climb or glide ►				
MANNER OF LEVELING OUT	smooth slight oscillations excessive oscillations ►				
2nd POWER CHANGE (If Needed)	proper improper				
MAXIMUM DEVIATION FROM RECOVERY ALTITUDE	within 50' within 100' within 200' over 200' ►				
MAXIMUM DEVIATION FROM RECOVERY HEADING	within 10 within 20 within 40 over 40 ►				
REMARKS ABOUT UNUSUAL ATTITUDES					

U A and P P 1

PRACTICAL PROBLEM

TRANSITION TO CLIMB OR GLIDE POWER CHANGE	proper	improper		
INITIAL NOSE ADJUSTMENT	proper	too high		too low
MAXIMUM HEADING DEVIATION DURING TRANSITION	10	20		over 20
MAXIMUM DEVIATION IN AIRSPEED DURING CLIMB OR GLIDE	5 kts	10 kts		over 10 kts
MAXIMUM HEADING DEVIATION DURING CLIMB OR GLIDE	10	20	40	over 40
TRANSITION TO NORMAL CRUISE POWER CHANGE	proper	improper		
DEVIATION FROM BASE ALTITUDE WHEN ALTIMETER STOPS	30	100'	200'	over 200'
MAXIMUM HEADING DEVIATION AFTER REACHING BASE ALT.	10	20	40	over 40
TURN TO BASE HEADING		1st turn	1st correction (if needed)	2nd correction (if needed)
	10			
	30			
	50			
	over 50			
MAXIMUM ALTITUDE DEVIATIONS (FROM BASE) DURING TURNS	50'	100'	200'	over 200'

PRACTICAL PROBLEM

	HEADING within				ALTITUDE within			
STRAIGHT & LEVEL LEG MAXIMUM DEVIATIONS	10	15	30	over 30	50'	100'	200'	over 200'
180 STANDARD RATE TURN (Mark at 10 Sec Check Point)	10	15	30	over 30	50'	100'	200'	over 200'
ROLL OUT (Mark When Wings Level)	5	10	20	over 20	50'	100'	200'	over 200'
TRANSITION TO GLIDE POWER REDUCTION	12" to 14"	below 12" or above 14"						
MAXIMUM ALTITUDE DEVIATION FROM BASE DURING DECELERATION	50'	100'	200'	over 200'				
MAXIMUM AIRSPEED DEVIATION DURING DESCENT	5 kts	10 kts		over 10 kts				
MAXIMUM HEADING DEVIATION DURING TRANSITION AND DESCENT	5	10	20	over 20				

REMARKS

ABOUT

PRACTICAL

PROBLEM

CALIBRATE INSTRUMENTS

INSTRUCTOR'S vs STUDENT'S

STUD ALT	STUD D G	STUD SWEEP
AT EVEN 1000'S	AT 0 HDG	AT 12 O'CLOCK
INSTRUCTOR'S	INSTRUCTOR'S	INSTRUCTOR'S
AT FT	AT	AT

AIR CONDITION TURBULENCE

smooth — moderately rough — very rough

USE OF TRIM TABS THROUGHOUT FLIGHT

Consistent proper use of tabs

Slightly improper use of tabs

Grossly improper use of tabs
includes failure to use

REMARKS

Instructor's Manual
For Objective-Type Check Flights

Prepared By

The Psychological Corporation

and

The U. S. Naval School of Aviation Medicine

Contract No. Noar-442 (00) (01)

Instructor's Manual

For Objective-Type Check Flights

INTRODUCTION

The primary purpose of this booklet is to familiarize you with the Objective-Type grading system which is currently being tried at BTU-1 (A Stage) and BTU-2 (D Stage). The experiment you are now participating in is a part of the Navy's continuing interest in improving its training program for Naval Aviators. Specifically, the experiment is an attempt to improve measures of pilot proficiency; to make these measures more accurate, more consistent, and less subject to individual opinions.

Every check pilot is faced with a difficult task when he is required to assign a grade to a student's performance. Many things make this a tough job. Most of us don't like to pass judgment on the performance of others, especially when a lot depends on our judgment, or when we are uncertain about our decision for any reason. Undoubtedly you have been required to make decisions as a check pilot where you felt some misgivings. You may have felt that the information on which you had to base the decision was inadequate, or that your judgment might have been influenced by the fact that you were tired after three hops, or perhaps you felt uneasy in deciding because of a strong personal like, or dislike, for the student involved. These factors are probably some of the important reasons why the present UBAA grading system turns out to be inadequate when we try to use it in research for predicting the subsequent performance of a student, or for assessing the effect of a syllabus modification, or the training value of a synthetic device.

The evidence from previous research clearly points to the fact that an improved grading system will depend upon providing the check pilot with a more adequate flight record on which to base his judgment. This information must be:

1. Sufficiently detailed to give a comprehensive picture of the student's entire performance.

2. It must be accurate, objective information regarding what the student actually did, as opposed to an individual check pilot's estimate of whether that performance was unsatisfactory, below average, average, or above average. When this objective information is collected on a large number of students, the decision as to what constitutes "good" performance or "bad" performance can be made on the basis of expert **group** opinion, rather than **individual** opinion.

Thus, a major goal of the Objective Type grading system is to make it easier to assign accurate grades on the basis of objective, factual information supplied by the check pilot.

The experimental Objective-Type Check Flight form used in this study has been developed by representatives of The Psychological Corporation and the U. S. Naval School of Aviation Medicine working in close cooperation with instructors at the operating units. The form represents the pooled efforts of a fairly large number of people. Our experience to date leads us to expect that as an even larger number of experienced check pilots become acquainted with the use of the form it will undergo considerable modification and improvement.

But, regardless of how good a check flight form may be, the grading system based on it is no better than the accuracy and understanding with which the check pilots use the form. The remainder of this booklet is, therefore, devoted to explanation of how the experimental grading form must be used in order to derive maximum benefit from it.

General Instructions

1. **Become completely familiar with the form.** A thorough study of the form, combined with experience in using it, will enable you to plan ahead and know what to look for in the student's performance. What the student actually does can then be recorded quickly, accurately, and easily.

2. **Do not rely on your memory.** Record your observations while the student flies through a maneuver, or as soon after as possible. In any event, always mark one maneuver before going to the next.

3. **Do not make allowances for the student.** Remember that complete recording of exactly what the student does is essential in the new grading method if we are to achieve a fair evaluation of it.

4. **Grade exactly what is called for by the form.** Considerable care has been used in selecting the items to be graded. If, however, the form does not cover the student's performance in some respect, make a note of it for discussion with the group who developed the form. Information obtained in this way will be useful in evaluating the grading system.

5. **Don't let the student's performance on a particular item influence the mark you give him on another.** There is a well-known tendency for most of us to base our judgments on the more outstanding, or spectacular features of the thing we are judging. This tendency can cause a check pilot to lower the student's grade for a takeoff just because his landing was poor. Constantly keep in mind that the marks you give should be accurate records of what the student did on each separate item.

6. **Make an entry for every item in the form.** Complete information is essential in order to evaluate student performance properly, and to allow detailed statistical analyses.

7. **Mark all places where the maneuver is interrupted or incomplete.** Whenever a maneuver is incomplete, the check pilot must indicate the point at which the maneuver was interrupted. In addition, he must indicate whether or not the interruption was caused by a student error.

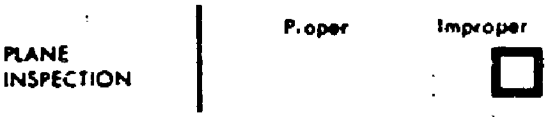
Specific Instructions For The A-19

Check Flight Form

A. **Types of items.** An attempt has been made to design the grading form for easy marking in the air. In all cases, the record of what the student actually did is made in one of two ways: 1) a check mark is placed in a box, or 2) a vertical line is placed on a scale.

Examples of the box-type and scale-type items are given below.

Example of Box-Type Item



Items of this type have descriptive labels for the different boxes to identify which box should be marked. In addition to the labels, the boxes themselves are printed differently. The boxes for correct, or proper performance are always dotted line boxes; light line boxes always refer to slightly incorrect or improper performance; and heavy line boxes consistently signify grossly improper performance.

Example of Scale-Type Item

This type of item is to be marked by placing a vertical line on the scale at the point which corresponds to the student's actual performance. Here again, dotted lines, light lines, and heavy lines are used to indicate different degrees in the quality of performance.

Thus, the need for writing notes on the hop is largely eliminated since a very accurate reconstruction of the student's performance can be made by reviewing where the check marks have been placed. Spaces for comments have been provided, however, and should be used when needed to specify the student's performance more completely.

B. **The meaning of "proper" and "improper."** In all cases where practicable, correct performance has been pinned down to definite limits of airspeed, altitude, heading, track, wing-tip distance, etc. In cases where this could not be done without unduly lengthening and complicating the form, the words "proper" and "improper" have been used. In these cases it should be understood by all check pilots that the syllabus definition of what constitutes proper performance on these particular items is the thing to go by.

In some cases, spaces are provided for two degrees of improper performance. The light lined box should be marked for "slightly improper" performance, while the heavy lined box is to be used for "grossly improper" performance. Marks in these "improper" boxes will not necessarily constitute a down for the student on the new grading system. An estimate of the relative importance of the items for determining grades will be obtained on the basis of group discussions with check pilots.

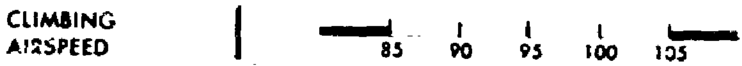
C. **The performance covered by a particular item.** Some items in the check flight refer to performance at a particular time or place. These items are momentary check points. On the other hand, there are some items in the check flight form which refer to performance over a period of time which, in some cases, is fairly long. Items of this kind may be thought of as maximum deviation items, where maximum deviation refers **to the largest error made during a certain period of time,** or while a certain maneuver is being performed. An example of each of these is given below.

Example of a Check-Point Item

	Proper	Wide or Close
DISTANCE AT No. 2 POSITION	☐	☐ ■

This item is of the check point type because it refers to the position of the airplane at a particular time; namely, when it passes through the #2 position. It does **not** refer to the track of the airplane **throughout** the traffic circle, but only to whether the track is proper or improper at a particular time.

Example of Maximum Deviation Item



The performance referred to by this item extends from the time the climb is begun until the transition to level flight is made. The maximum deviation from proper climbing airspeed **throughout the entire climb** is the thing which should be marked. In order to insure that the maximum deviation is recorded, it may be necessary for you to make several different marks on the scale if the student's airspeed is variable. Leave all these marks on the scale; the maximum deviation mark can be selected easily from the group of marks.

D. **How to handle wave-offs.** We can distinguish between two different kinds of wave-off: 1) the kind necessary when the student is at fault and has maneuvered the plane into a dangerous situation, and 2) the kind necessary because of a foul deck, another plane cutting in, etc. This is an important distinction from the standpoint of grading and the two types should therefore be marked differently. Another important difference is whether a student takes his own wave-off, or whether the check pilot has to take the initiative, either by taking over or by telling the student to go around again.

In order to standardize marking, the procedure outlined below should be followed:

1. Grade all items down to the point where the wave-off occurred.

2. At this point, mark either IWO (for instructor's wave-off), or OWO (for own wave-off). In addition, mark either SF (for student's fault) or NSF (for not student's fault).

3. If the student is given a second trial at that particular landing, grade all of the items for the

second trial on the same page where the wave-off occurred. Use the symbol "2" instead of check marks for the second trial.

E. **Detailed explanation of the form.** The remainder of this booklet is devoted to a detailed explanation of particular items in the form. It will be helpful for you to take your copy of the check form now and follow it as you read the rest of the instructions.

1. Pre-Flight and Taxiing.

Items on this page cover the student's performance from the time the check flight begins with the plane inspection, until the student is ready to takeoff. The page should be filled out and turned before power is applied for takeoff.

2. Initial Takeoff and Field Departure.

Items on this page which need special explanation are:

a. Nose Attitude Just After Airborne. This item refers to the attitude immediately after takeoff. The proper attitude, as stated in Training Instructions - SNJ, is halfway between the climbing attitude and the attitude for straight and level flight.

b. Climbing Airspeed. This item refers to the maximam deviation from proper climbing airspeed between the altitude of 100 feet and the altitude at which the transition to straight and level flight is made.

3. Standard Field Entry.

All items on this page should be marked as the student flies through the maneuver. Detailed explanation is needed for the following items:

a. Altitude in Circle. Mark the maximum deviation from 1000 feet.

b. Airspeed in Circle. Mark the maximum deviation from 120 knots.

c. Lowers 1/2 Flap. The "forgot" box should be marked if the student fails to lower flaps before reaching 500 feet.

d. Airspeed in Letdown. Mark the maximum deviation from 95 knots throughout the time the student is gliding from 1000 feet to 500 feet.

e. Transition at 500 feet. Here the altitude and the airspeed items are to be marked at the time the airplane is first in straight and level flight

1. 500' Pattern Touch & Go Landings.

This page of the form presents the toughest problem of the entire check flight. On the one hand, landings are the most important maneuvers in the entire A-12 Check and consequently should be graded most accurately. On the other hand, the very nature of the landing sequence makes it the hardest part of flight to grade in accurate detail. The present format represents the end result of several revisions, but it may still be in need of several more. We can only determine this after a more extensive tryout than we were able to conduct before this portion of the experiment began.

Pilots who used the form in the exploratory try-outs reported that it can be marked safely and accurately if the following procedure is followed:

a. Know the form so well that, as the student flies the pattern, you know exactly what aspects of his performance to single out for attention. You should study the form until you can do this without having to consult the form.

b. Mark the first six items as the student flies through them, or as soon thereafter as possible. (Traffic Interval, through Begins Approach Turn).

c. **Do not attempt** to mark the rest of the page until after the student has completed his landing and has climbed to 500 feet.

d. Quickly mark the rest of the page on the first part of the downwind leg.

The following items need detailed explanations:

a. Downwind Leg Airspeed. Mark the maximum deviation from 90 knots for the entire leg.

b. Altitude Downwind. Mark the maximum deviation from 500 feet for the entire leg.

c. Approach Airspeed. Proper approach airspeed is 80 knots to the straightaway and 75 knots in the straightaway. Mark the maximum deviation from proper airspeed throughout the **entire** approach, including the straightaway.

d. Manner of Touchdown. Here the items on Track Alignment, and Attitude refer to the touchdown and not the final approach. They are to be marked according to what they were at the moment of touchdown.

e. Airspeed in Climb. Mark the maximum deviation from proper airspeed (depending on flap condition) for the entire climb from 100 feet to 500 feet.

5. Low Altitude Emergencies.

Space is provided for two trials. At least one should be given at some time during the check, but not necessarily at the place it occurs in the booklet. The maneuver should be graded as soon as possible after it occurs, and always before the next maneuver is given.

6. Steep Turns.

Provision is made for four Steep Turns, two to the right, and two to the left. All check pilots should give at least one in each direction.

7. Slow Flight.

Every item on this page refers to performance throughout the entire slow flight maneuver. This maneuver is started in Normal Cruise, evolves a transition to Slow Flight, and a transition back to Normal Cruise. Be sure to mark **the maximum deviation** in Altitude and Heading throughout.

8. Stalls.

For purposes of the experimental tryout, all students will be given four stalls including the three written in on the form. The fourth stall may be any stall the student is responsible for knowing. The name of this stall must be written in the space at the top marked "Optional."

9. Spins.

a. Note that in connection with use of stick in the spin, two boxes can be marked for the same performance, provided the student uses aileron. Always mark whether stick was full back or not, and whether recovery was positive or hesitant, even if the "uses aileron" box is marked as well.

b. Only one spin will normally be given, although space is provided for two if needed.

10. High Altitude Emergencies.

a. Gliding Airspeed. Mark the maximum deviation from 95 knots throughout the letdown.

11. Traffic Entry and Landing at Home Field.

a. Airspeed in Letdown. Record the maximum deviation from the time the student begins to lose altitude until he begins the transition at 600 feet.

b. Altitude Control (in 600 foot pattern). Mark the maximum deviation from 600 feet throughout the pattern.

c. Airspeed Control. Mark the maximum deviation throughout the pattern.

d. 1/2 Flaps if George Flag Flying. Draw a line through this item if the George Flag is not flying since, in this case, the item is not applicable.

12. Approach and Final Landing at Home Field.

The comments under Touch and Go Landings apply here. Whereas no attempt should be made to grade the landing as it occurs, it should be graded as soon as possible after it is made.

13. The remainder of the form should be filled out after the hop is completed. Items in this part of the Check cover general points related to the entire flight

a. Weather Conditions. Draw a vertical line on the scale for turbulence, and another on the scale for distinctness of horizon.

b. Cross Wind. Estimate and write in the angle and velocity of crosswind that existed at the crosswind landing field. Your marks should cover a no-wind condition when it exists.

c. The remainder of the items are self-explanatory.

Specific Grading Instructions

For D Stage

CALIBRATION OF INSTRUMENTS

Since the correctness of objective-type grading depends in part upon the accuracy of instrument readings, it is necessary that the Altimeter, Directional Gyro and Clock on the instructor's panel be calibrated as follows:

On the Cover Sheet (Cover 1), the student will be instructed to calibrate his Altimeter and Directional Gyro with the instructor's. At the top of CP 1 (the first sheet of Charlie Pattern) the calibration is to be accomplished in the same manner as above except that a Time Check will be added.

On CP 8 (the last page of Charlie Pattern), the instructor will set the plane on proper Heading and Altitude, and record the student's Altitude and Heading when his (the instructor's) is at zero heading and at an even 1,000 feet of Altitude. The Time Check is to be repeated here also.

The Grading form provides for calibration prior to TURN PATTERN, CHARLIE PATTERN, and UNUSUAL ATTITUDES, as well as after completion of PRACTICAL PROBLEM:

TYPES OF ITEMS

In the entire grading form there are but two major types of items used, and the ways in which these items are used can be broken down into four sub-types: (1) Maximum Deviations, 2) Check Point Items, 3) Manner of Performance Items, 4) Manner of Correction Items.

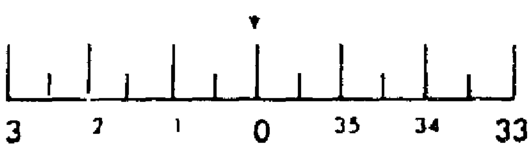
Looking at them one by one you can see that your observations are made in either of two ways: (1) By making a mark on a scale (2) and by placing a mark in a box. All four sub-types of items are, at one place or another in the form, graded by both the scale and box method.

The four sub-types are illustrated below:

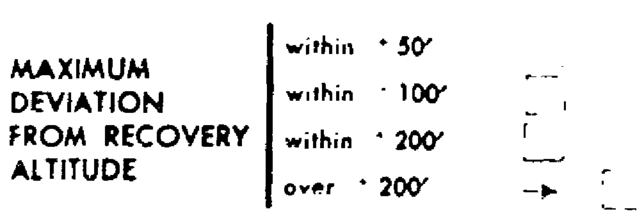
1. **Maximum Deviations** Items of this sort require that the check pilot observe over a period of time (usually on one leg of a pattern, during one turn, etc.). At the end of the time mark down the greatest amount that the student deviated, both plus and minus, from the required altitude, heading, airspeed, etc., for that period of time. If you record these deviations on a scale-type item you mark the places on the scale which correspond to the greatest deviations you observed during the time. In these cases scales are printed on the form which closely resemble the instrument from which you read the deviations. In the box-type items, make a mark in the box labeled with the deviations into which the student's **greatest** deviations fall.

SCALE

Heading



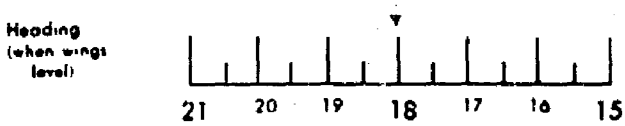
BOX



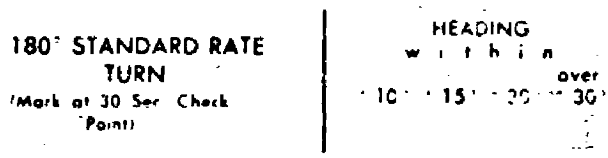
2. **Check Point Items** In many cases maximum deviations do not answer the question of proficiency as well as do recordings of what the situation was at a particular time or place in a maneuver. For that reason, some items in the form require that you mark exactly what the altitude, airspeed, heading, etc., happened

to be at intervals throughout a pattern or part of a pattern. Other times it is necessary to select another reference, for example, the instant at which the student first has the wings level, for marking the time heading, etc. In each case, the form makes clear the particular reference point used, and the instrument readings to be recorded at that time. The form is so designed that a check pilot should not be unduly rushed.

SCALE



BOX



3. **Manner of Performance Items.** Since the student's maximum deviations over a period of time, and "cross sections" of his behavior at particular times still do not provide a complete picture of his performance, it is necessary to record the **manner** in which the student performs some essential operation. In the grading form this type of item is found in connection with "Power Addition" and "Power Reduction," and attitude adjustments. In this type of item, it is necessary that the check pilot make a "best estimate" of the performance in terms of his experience and "know-how." On this basis he then marks the student's performance. On a scale-type item the mark may be made anywhere on the line. In the box-type items it is necessary to fit the performance into one of the categories listed.

SCALE

Power Reduction

- early
- prompt
- forgets

BOX

INITIAL WING ADJUSTMENT

- smooth & positive
- under corrects
- over corrects
- uses elevator pressure

4. **Manner of Correction** In many cases it is not of so much importance that the student gets off the assigned altitude, airspeed, etc., as it is that he realizes he has deviated and corrects for it. In most cases throughout the form, this **manner of correction** is graded on a scale allowing the check pilot to make detailed discriminations. Here again, it is up to the check pilot to evaluate the manner of correcting in light of his "know-how" and record it as accurately as possible on the form. Although manner of correcting is utilized in many different situations throughout the form, the general pattern is the same.

SCALE

Manner of Correcting Altitude

prompt	smooth
slow	uneven
never	rough

BOX

MANNER OF LEVELING OUT

- smooth
- slight oscillations
- excessive oscillations

Now with the check flight form in one hand and this booklet in the other, go through them item by item until you are sure that you can find all the correct spaces when you are in the air.

DETAILED SUGGESTIONS ON SPECIFIC ITEMS

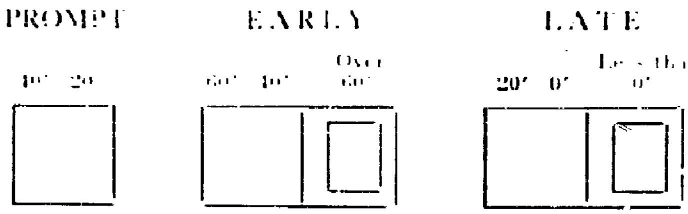
1. **How to Indicate Interruptions** When the instructor decides to stop any maneuver prior to completion, a heavy line will be drawn at the point where the problem is interrupted and grading stopped. (The reasons for interruptions of the problem may be: clouds, presence of other aircraft, excessive performance deviations, confusion of the student, timing off in Charlie by more than 30 seconds, etc.). The instructor will then reset the problem at any place before the interruption, at his own discretion, and commence grading again when the heavy line is reached. It will be necessary to have a detailed explanation of any interruption at the conclusion of the maneuver. If necessary, the explanation may be continued on the back of the last sheet of the maneuver.

2. **Definition of Power Items** At several points the check pilot is required to mark the time at which power is added or reduced. Sometimes the clock reading is taken as the measure of proper or improper timing. At other times the number of feet of altitude lead is used as a measure. In the following examples the seconds refer to actual clock readings, while the feet measurements refer to number of feet lead used by the student.

   a. CP 4—Power Reduction.

	Seconds
	54
Early	
	58
Prompt ——→	
	02
Forgets	
	06

b. CP 5 First Power Addition (second item on page) is defined in terms of altitude lead as below:

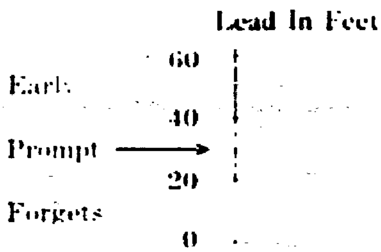


c. CP 5 Second Power Addition. "Prompt" is defined as a clock reading from 25 to 28 seconds. "Early" from 24 to 26 seconds for the single box, while the double box includes any clock reading which is less than 24 seconds. The single box under "Late" covers 28 to 30 seconds while the double box covers any clock reading in excess of 30 seconds.

d. CP 6 Power Reduction is defined exactly as in Item b, above.

e. CP 7 Power Reduction (first item on page) is "Prompt" if made at 55 to 58 seconds, slightly "Early" if made from 54 to 56 seconds, and slightly "Late" at 58 to 60 seconds. By agreement among the instructor board, the double box under "Early" includes any lead before 54 seconds while the double box under "Late" indicates the clock was past 60 seconds.

f. CP 8 Power Addition. The second power change should read "Normal Cruise" instead of "Fast Cruise." For "Slow Cruise," power reduction is defined as follows:



3. **Unusual Attitudes Practical Problems.**

a. In most Unusual Attitudes, there are two power changes. The form is set up for the Nose Low Unusual Attitudes and follows sequentially. When grading the Nose High Unusual Attitudes, however, power items are not in proper sequence but must be graded in the spaces provided on the form. In the case of Nose High Unusual Attitudes this will require that the instructor mark the power addition for level speed change to Normal Cruise in the boxes provided at the top of the grading form. The set of boxes in the middle of the page will be used to indicate whether power is properly reduced when Normal Cruise airspeed is reached.

b. Manner of Leveling Out. "Smooth" is defined as not over one oscillation, with this oscillation being less than 50 feet in amplitude. "Slight Oscillation" is defined as not over three in number and not over 100 feet in amplitude of oscillation. Any oscillations greater than the above in either number or size are to be marked "Excessive."

c. Recovery Altitude is defined as that altitude after wings are level and the altimeter first stops.

d. Recovery Heading is defined as that heading when wings are first level.

4. **Practical Problem Sheet Only.**

a. When climb or glide is first mentioned, cross out either climb or glide, leaving the appropriate item unmarked.

b. The maximum heading deviations are measured three times on PP 1, to be marked as follows:

1. Deviation from Recovery Heading during transition.

2. Second heading deviation is from the heading at the end of transition, through the climb or glide.

3. Third heading deviation is from the heading at the end of climb or glide, through the transition to normal cruise and up to the beginning of Turn to Base Heading.

Indicate whether the deviation is plus or minus in all three heading deviations above. The heading deviations in each case are to be measured from heading position at the beginning of the interval covered by the heading item.

5. **Transition to Climb** Mark the dotted box for any power setting which is "Proper" plus or minus 1 inch; mark the lined box for discrepancies of over plus or minus 1 inch.

U. S. Naval School of Aviation Medicine, Naval Air Station, Pensacola, Florida, and the Psychological Corporation, New York, New York. 1 July 1952

Joint Project Report No. NM 001 058.24.01

"The Development and Tryout of Objective Check Flights in Pre-Solo and Basic Instrument Stages of Naval Air Training."

Hardy C. Wilcoxon, The Psychological Corporation; Woodbury Johnson, U. S. Naval School of Aviation Medicine; David L. Golan, The Psychological Corporation.

61 pp. 1. Illustration UNCLASSIFIED

To develop and tryout objective check flights in two selected stages of Naval Air Training.

Objective check flight booklets were developed and tried out in the pre-solo and basic instrument stages. Reliability coefficients were computed from successive independent check rides on 100 students graded by the existing check flight forms, and 100 students graded by the experimental check flight forms. No increase in ride-ride reliability of the check flights was found through objective grading of the standard check flight content.

1. Rating Methods 2. Pilot Training

I. Wilcoxon, Hardy C. II. Johnson, Woodbury III. Golan, David L.

U. S. Naval School of Aviation Medicine, Naval Air Station, Pensacola, Florida, and the Psychological Corporation, New York, New York. 1 July 1952

Joint Project Report No. NM 001 058.24.01

"The Development and Tryout of Objective Check Flights in Pre-Solo and Basic Instrument Stages of Naval Air Training."

Hardy C. Wilcoxon, The Psychological Corporation; Woodbury Johnson, U. S. Naval School of Aviation Medicine; David L. Golan, The Psychological Corporation.

61 pp. 1. Illustration UNCLASSIFIED

To develop and tryout objective check flights in two selected stages of Naval Air Training.

Objective check flight booklets were developed and tried out in the pre-solo and basic instrument stages. Reliability coefficients were computed from successive independent check rides on 100 students graded by the existing check flight forms, and 100 students graded by the experimental check flight forms. No increase in ride-ride reliability of the check flights was found through objective grading of the standard check flight content.

1. Rating Methods 2. Pilot Training

I. Wilcoxon, Hardy C. II. Johnson, Woodbury III. Golan, David L.

U. S. Naval School of Aviation Medicine, Naval Air Station, Pensacola, Florida, and the Psychological Corporation, New York, New York. 1 July 1952

Joint Project Report No. NM 001 058.24.01

"The Development and Tryout of Objective Check Flights in Pre-Solo and Basic Instrument Stages of Naval Air Training."

Hardy C. Wilcoxon, The Psychological Corporation; Woodbury Johnson, U. S. Naval School of Aviation Medicine; David L. Golan, The Psychological Corporation.

61 pp. 1. Illustration UNCLASSIFIED

To develop and tryout objective check flights in two selected stages of Naval Air Training.

Objective check flight booklets were developed and tried out in the pre-solo and basic instrument stages. Reliability coefficients were computed from successive independent check rides on 100 students graded by the existing check flight forms, and 100 students graded by the experimental check flight forms. No increase in ride-ride reliability of the check flights was found through objective grading of the standard check flight content.

1. Rating Methods 2. Pilot Training

I. Wilcoxon, Hardy C. II. Johnson, Woodbury III. Golan, David L.

U. S. Naval School of Aviation Medicine, Naval Air Station, Pensacola, Florida, and the Psychological Corporation, New York, New York. 1 July 1952

Joint Project Report No. NM 001 058.24.01

"The Development and Tryout of Objective Check Flights in Pre-Solo and Basic Instrument Stages of Naval Air Training."

Hardy C. Wilcoxon, The Psychological Corporation; Woodbury Johnson, U. S. Naval School of Aviation Medicine; David L. Golan, The Psychological Corporation.

61 pp. 1. Illustration UNCLASSIFIED

To develop and tryout objective check flights in two selected stages of Naval Air Training.

Objective check flight booklets were developed and tried out in the pre-solo and basic instrument stages. Reliability coefficients were computed from successive independent check rides on 100 students graded by the existing check flight forms, and 100 students graded by the experimental check flight forms. No increase in ride-ride reliability of the check flights was found through objective grading of the standard check flight content.

1. Rating Methods 2. Pilot Training

I. Wilcoxon, Hardy C. II. Johnson, Woodbury III. Golan, David L.

U. S. NAVAL SCHOOL OF AVIATION MEDICINE
NAVAL AIR STATION
PENSACOLA, FLORIDA

JOINT PROJECT REPORT

The Psychological Corporation, New York, New York
under Contract Nonr-442(00)(01)
and
U. S. Naval School of Aviation Medicine
Project No. NM 001 058.24.01

THE DEVELOPMENT AND TRYOUT OF OBJECTIVE CHECK FLIGHTS IN PRE-SOLO AND BASIC INSTRUMENT STAGES OF NAVAL AIR TRAINING

Report by

Hardy C. Wilcoxon, Ph.D.
Lieutenant Commander Woodbury Johnson, MSC, USN
David L. Golan, M.A.

Approved by

George K. Bennett, Ph.D., President
The Psychological Corporation
and
Captain Ashton Graybiel, MC, USN
Director of Research
U. S. Naval School of Aviation Medicine

Released by

Captain James L. Holland, MC, USN
Commanding Officer

1 July 1952

CONTENTS

ACKNOWLEDGEMENTS

The writers wish to express their appreciation to the many individuals in the Naval Air Training Command who aided in the planning and conduct of this research. Staff officers of the Chief of Naval Air Training and Chief of Naval Air Basic Training gave valuable cooperation, as did the Commanding Officers of Whiting Field and Corry Field. The Officers-in-Charge of the training units, the Assistant Officers-in-Charge, the Schedules Officers, and Jackets Officers all gave valuable assistance.

We especially want to thank the flight instructors who helped develop the experimental grading forms. Those who participated in our conferences in the developmental phase of the study, and who assisted greatly in the exploratory tryouts and revisions were:

WHITING FIELD

BTU-1 North

LTJG A. Essert, USN
LTJG E. Huber, USN

BTU-1 South

LT G. R. Finke, USN
LT W. R. Horner, USN
LT J. O. Long, Jr., USN
LT F. M. Sandidge, USN

CORRY FIELD

BTU-2

LT L. A. Bagby, USN
LT C. F. Demmler, USN
Capt. J. C. Donovan, USMC
LT J. R. North, USN
LT R. A. Schulze, USN
LTJG R. M. Delorenzi, USN
Kouns, A. R., ADC(AP), USN
Sievers, A. W., AOC(AP), USN
Lewinski, R. R., AD1(AP), USN

SUMMARY

The purpose of this project was to develop and evaluate objective, in-flight grading methods for pre-solo dual and basic instrument stages of Naval Air Training.

Experimental objective check flight booklets were developed with the cooperation of personnel actively engaged in teaching these phases. The general approach involved:

1. Concentration on standardized check flights as the primary measure of proficiency.
2. Obtaining an itemized, objective record based on what the student actually did during the flight.
3. In-flight marking of the performance as it occurred or as soon thereafter as practicable.
4. Insuring a clear definition of the maneuvers to be performed and the manner in which they were to be graded.

The evaluation of the experimental forms and the currently used grading forms was conducted in two parts. In the first part approximately 100 students in each stage received two successive check flights graded on the basis of current ATJ forms only. In the second part other groups of approximately 100 students in each stage received two successive check rides graded by means of the objective forms as well as the current ATJ sheets.

Comparisons of the experimental objective grading forms and the currently used ATJ forms were made in terms of ride-ride reliability and split-half reliability. In addition, the reliability of "up" and "down" grades awarded on ATJ forms was investigated. An item analysis of the Stage A objective grading booklet was performed.

Results indicate that the attempt to improve the ride-ride reliability of the Stage A

and the Stage D check flights through the use of objective grading methods was unsuccessful. Split-half reliabilities indicate that both ATJ forms and the objective grading forms have considerable internal reliability. The ATJ grades of "up" and "down" are awarded to the same student very inconsistently by different check pilots.

The major conclusion is that the objective grading methods developed and evaluated in this study are not suitable for routine use in Naval Air Training. Although some advantages accompany their use, the disadvantages resulting from the complexity of the grading forms make them impractical.

In view of the many important advantages of objective grades, continued efforts should be made to develop practical methods of obtaining them.

The present results suggest that predictions of student performance must be based on a wider sample of behavior than that afforded by a single check flight. This agrees with the wartime research of the Army Air Forces (7). The major implication is that more than one check flight must be given to provide reasonably accurate prediction. In the case of the safe-for-solo check at the end of Stage A, where the important prediction is made that the student will or will not be safe-for-solo on his next flight, two independent check rides are recommended.

Chapter I

INTRODUCTION

The primary mission of the Naval Air Training Command is to produce pilots of high quality. To attain this objective it is essential that accurate methods be available to measure the complex skills required in military flying. Lacking fairly precise measurement, efforts to evaluate the flight training process encounter nearly insurmountable obstacles. The research problem of developing and maintaining improved measures of flight proficiency, therefore, has fundamental importance.

A scientific approach to the problem of obtaining the highest possible quality in the product turned out by a training organization discloses three basic requirements:

a. Adequate selection procedures must be utilized to insure that trainees entering the program represent the best raw material available.

b. The training operation itself must be subject to continuing modification and improvement designed to make the most of the raw material supplied.

c. An efficient procedure for advancement and elimination must be employed in order to accelerate the flow of students who reach the required proficiency, and to eliminate as early as possible those students who are likely to fail.

The Importance of Flight Grades

None of the above requirements can be satisfactorily met without accurate measures of flight proficiency. The evaluation of selection tests and training programs depends upon measures of flying skill, while decisions regarding advancement and elimination must often be based on flight grades.

Selection tests can only be evaluated in terms of how well they predict the later performance of applicants. The best yardstick now available for measuring the value of a selection procedure is the criterion of whether a student passes or fails in the training program. A much better measure for test evaluation would be one which accurately discriminates various levels of flying skill. But in any event, the selection program is effective only in so far as it admits applicants who will make good Naval Aviators and excludes those who will not. Therefore, the evaluation of selection effeciency depends in great part upon the accuracy of techniques of measuring flight skills.

The Navy frequently exerts effort to improve its flight training program through the use of new training devices, syllabus modifications, etc. In order to determine whether these efforts have their desired effect on the quality of the finished aviator, an accurate method of assessing flight proficiency is clearly needed.

An inaccurate flight grading system makes for waste and inefficiency. In view of the rising costs of pilot training, this point has become increasingly important. When errors are made which involve either attrition of a man who might later have become a proficient Naval Aviator, or retention of a man for a long period, with eventual failure in an advanced stage, sizeable investments in time and money are lost. Any improvement in the accuracy of decisions regarding advancement and elimination would be of great value, both to the Navy and to the students involved.

The above considerations point to the basic importance of flight grades for evaluation of all aspects of the training program. It is important that the methods of grading in current use be examined in the light of how well they accomplish this function.

The Need for Improved Measures of Flying Skill

In December, 1948, a study of flight grading was undertaken by The Psychological Corporation at the request of the Bureau of Medicine and Surgery, Division of Aviation Medicine. That study (1), published in May 1949, involved a statistical analysis of data from the Flight Training Jackets of 337 U. S. Naval Aviation Cadets in Basic Training. In the course of this analysis it became clear that the subjective rating scales used to determine flight grades were not highly reliable. They did not furnish an adequate criterion for the evaluation of selection tests or training experiments. Furthermore, their ability to predict performance from one stage to another was very low. This created a situation where some students were retained too long before being dropped and where others were probably dropped unnecessarily.

These conclusions concerning grades in Basic Training were confirmed in a similar study of Naval Air Advanced Training grades (6) published in 1950.

Additional evidence from many sources supports the general conclusion that flight grades based exclusively on subjective ratings are inadequate. Reviews of the relevant research may be found in several sources (1, 4, 7) and need not be repeated here.

Indications That Improvement is Possible

In addition to pointing out deficiencies, research on the problem of flight grading has suggested many promising methods of improvement. The most successful application of these methods has been Gordon's development of a standard flight check for the airline transport rating (4). This check flight incorporated the following characteristics:

1. Tasks required of the candidate were selected on the basis of a thorough study of the critical requirements of the airline pilot's job.

2. The tasks were arranged into a standard flight.

3. The form was designed to facilitate accurate judgments.

4. Grading relied most heavily on objective observation of deviations from set performance limits, but included more subjective items when necessary for relevance and practicality.

The reliability of this check flight, as determined in a tryout with airline pilots, is the highest ever reported for two successive check rides graded by two different check pilots, being .5[illegible] in one study and .76 in a later one (4).

The standardized flight and objective recording, two techniques successfully utilized in Gordon's study, were previously developed by the research program of the Committee on Aviation Psychology, National Research Council (10). Many other valuable contributions to the problem of improving measures of flying skill arose from World War II research.

In short, research on flight grading indicates a need for the improvement of current methods of measuring flight proficiency and also indicates that improvement is possible.

Plan and Purpose of This Project

The development of improved measures of flying skill is a complex problem and requires long-range research planning. As a result, The Psychological Corporation and the U. S. Naval School of Aviation Medicine undertook the project jointly in order that research personnel in the Navy would participate directly and thereby be in a more favorable position to carry on the work after the termination of the contract.

Representatives of The Psychological Corporation recommended an over-all plan which involved three steps:

1. Development and tryout of objective check flights in selected stages of Naval Air Training.

2. Extension of the methods developed to other stages, provided the methods proved to be improvements.

3. Implementation of the new method of grading in all phases of flight training where it proved valuable.

It was anticipated that step one would be accomplished under contract with The Psychological Corporation, while steps two and three would be carried out by the School of Aviation Medicine. The present report is based on the work done in step one under Contract Nonr 442 (00)(01).

The purpose of this study was to develop and evaluate objective flight checks in selected stages of Naval Air Training. Stages A and D were selected for study. Stage A was chosen because most flight failures occur there, making any improvement in accuracy of grading highly desirable. Stage D was selected since instrument flying appears to lend itself easily to objective grading.

Results of the investigation are disappointing, but by no means warrant a conclusion that attempts to improve flight grading methods in the Navy are futile. The grading measures developed and tried out do not prove superior to currently used measures based on ATJ forms. However, to abandon the attempt at improvement after one unsuccessful trial would be a mistake in view of the potential advantages that improvement would bring. The problem is important enough to warrant vigorous and sustained efforts toward solution.

Chapter II

DEVELOPMENT OF THE CHECK FLIGHT FORMS

The General Approach

While the general approach followed in developing the grading measures used in the present study was based on suggestions obtained from many different sources (cf. References), our particular application of the results of these earlier studies involved only four main aspects.

1. Concentration on standardized check flights as the primary measure of proficiency.
2. Obtaining an itemized, objective record based on what the student actually did during the flight.
3. In-flight marking of the performance as it occurred or as soon thereafter as practicable.
4. Insuring a clear definition of the maneuvers to be performed and the manner in which they were to be graded.

Since it would obviously be impractical to attempt to grade all aspects of every maneuver a student performs throughout his training and may well be impractical to attempt to grade everything a student does on any one flight, the aspects of performance which are graded must be selected out of the total behavior of the student. The question becomes one of what aspects of behavior to select for grading.

An earlier study by The Psychological Corporation indicated that certain parts of the student's flight jacket yielded stage grades which were just as stable as an overall average based on grades from all of the flights in the stage. These relatively stable parts of the student's performance record tended to be the scores made on regular check flights. One of the major conclusions of this earlier study was:

> Check flight A-19 alone is the best predictor of later success or failure in Basic Training. (The biserial coefficient of correlation is .45). All flight ratings for Stage A yield a coefficient of .18 while the instructor check flight, A-18, produces a coefficient of .20. This finding suggests that efforts to secure improved measures of flight proficiency can most profitably be concentrated upon check flights. (1, p. 2).

Thus, it seemed that check flights given by pilots other than the student's own instructor provided a relatively favorable atmosphere for accurate, unbiased grading.

Another reason for focusing attention on check flights was the fact that a grading system based on a few crucial flights would be much simpler to work with administratively than would a system based on daily flights. In addition, it was anticipated that objective grading would be more laborious from the instructor's standpoint than the currently used subjective grading scale. Hence, we preferred to restrict its use to a small number of flights.

Having decided to concentrate upon attempting to improve the grading of check flights, the next question to be decided was what the content of the check flight should be. The earlier analysis of Naval Air grading published by The Psychological Corporation (1), indicated that check flight scores based upon a few maneuvers considered as most important by groups of experienced instructors seemed to be as reliable as scores based upon the total of all maneuvers in a check flight. This suggested that improvement in check flight ratings might be effected by focusing attention on the rating of the smaller number of selected maneuvers.

It was originally planned to act upon the above suggestion from the earlier study.

During the development of the check flight forms, however, a number of difficulties arose which prevented our acting on this suggestion. The most critical difficulty was the fact that basing the check flight on a few selected maneuvers would have involved a radical change in the content of the check flights. Since the experimental tryout was to be conducted in regular training units where Aviation Cadets and Officers were undergoing training for designation as Naval Aviators, it was considered infeasible to substitute an untried check flight content in the place of the already established flights.

For practical reasons, therefore, it was necessary to leave the check flight content as it stood in each stage and develop objective grading measures for the maneuvers normally given in checks at the end of Stage A and Stage D. Since the check flights at each unit incorporated practically all of the maneuvers learned by students in the respective stages, and in some cases provided for repetition of crucial maneuvers, the check flights had considerable representativeness in regard to the stage syllabus content and, at the same time, had some of the repetitive features which seemed desirable.

The Procedure

The first step in the development of the check flight forms used in the present research was to set up an Advisory Board at each of the two units involved: BTU-1, Whiting Field and BTU-2, Corry Field. These boards consisted of certain administrative officers and at least four highly experienced flight instructors from each of the units.

Representatives of The Psychological Corporation and the School of Aviation Medicine served as technical advisors on these boards. The function of the boards was to furnish overall guidance for the general aims of the research and to determine policy in regard to the conduct of the experimental tryout.

The actual work involved in constructing the check flight forms was done by a panel selected from the Advisory Board. This panel consisted of the experienced flight instructors plus The Psychological Corporation representatives and the representative from the School of Aviation Medicine. This working committee, or panel, met for three to four hour sessions two days a week for approximately two months at each of the training units.

The first step taken by the working panel was to study the syllabus intensively at both Stage A and Stage D. This syllabus study had two aspects. First, it was necessary to perform a routine check of the content of the syllabus as prescribed in Naval Air Basic Training Instructions. For the benefit of readers who are not familiar with these stages of training, the syllabi are presented in Appendix A.

Following the study of the syllabus, discussions were held with the experienced pilots on the panel in order to determine the precise ways in which the syllabus was administered to the students in every-day practice. The major purpose of our syllabus discussions was to clearly define the manner in which the syllabus was given, as a preliminary step to the discussion of particular maneuvers which would be objectively graded in the check flight forms.

The outgrowth of these discussions was a list of maneuvers which included every maneuver graded on the A-19 check ride and the D-11 check ride. Each maneuver in this list was then analyzed in our conferences in order to discover what its measurable components might be. As was expected, lively disagreements among the check pilots often occurred and required postponement of final decisions regarding which components of a particular maneuver could be subjected to objective measurement. These disagreements were resolved in two ways: (a) special flights would sometimes be taken in order to investigate in the air the point on which disagreement had occurred, or (b) the instructors involved in the disagreement would look for the point under discussion in their regularly scheduled hops.

On the basis of the information arrived at in the above ways, the maneuver items in the check flight forms enclosed in this report were constructed and tried out in the air. Once items were constructed for all the maneuvers in the check flight, the entire check flight was given an exploratory tryout by from five to ten experienced instructors within the two units involved.

It became obvious during these exploratory tryouts that no absolutely final decisions regarding maneuver items could be made without an extensive tryout of the entire check flight. As a result, the number of exploratory tryouts was limited to three at each of the units. The most extensive of these exploratory tryouts, the final one, involved approximately 50 flights at each of the two training units.

Hence, the revised items and format which were adopted for use in the major experimental tryout represent our best approximation to objective check flights for these particular stages following the limited amount of time available for development and revision.

The two check flight forms used in the major experiment, as well as the instructor's manual used in indoctrinating instructors, are enclosed in the cover pockets of this report. The reader may refer to the forms to obtain detailed information regarding their content, and to the instructor's manual for a description of how they were used.

ATJ forms for Stage A and Stage D are reproduced in Appendix B.

Chapter III

THE EXPERIMENTAL TRYOUT

To be useful, grades must predict performance in some future activity. When flight grades are used for elimination, and for advancement from one stage to another, they are really predictions about the future performance of students. If they tell us only about some temporary differences in ability among a group of students, and do not successfully predict that these same differences will tend to exist in the future, they are of no value.

Since flight grades are used as a basis for elimination and advancement in Naval Air Training, the above point is of great importance; and it is obviously desirable to find out whether grades do, in fact, predict later performance.

The best way to assess the desired predictive power of flight check grades is to administer two check flights to the same individual by different check pilots. A correlation coefficient calculated between the scores made by a group of students on the two check rides provides the index of predictive power needed. If it cannot be predicted from a student's score on one check ride what his score on an identical second check ride will tend to be, it is impossible for this score to predict anything else. The technical name for this statistical measure of the consistency of flight grades is the ride-ride reliability coefficient.

The purpose of the experimental tryout was to compare the newly developed check flight forms with the check flight forms in current use. The main comparison made was between the consistency of the experimental grading system and the consistency of the current one, utilizing the ride-ride reliability coefficient as the measure of consistency.

In order to secure data for the comparisons needed, the experiment was run in two parts at each of the two units studied. The first part of the experiment at each unit consisted of a study of the ATJ grading system used alone. During this part of the study approximately 100 students in Stage A and 100 students in Stage D each received two successive check flights at the end of the respective stages. In this manner data were provided which permitted a statistical test of the agreement between the grades awarded to the same student on two different occasions by two different check pilots who were grading on the basis of ATJ forms.

The second part of the experiment consisted of a study of the new grading system when used with the old. In this phase of the study, again, approximately 100 students at each of the training units received two successive, independent check rides. On these check rides the pilot graded the students in the air utilizing the newly developed objective check forms. In addition, on returning from the check flight, the pilots filled out the ATJ forms in order that official Navy grades might be assigned to the students participating in the experiment. Thus, in the second part of the experiment, data were collected on the objective grading system as well as the subjective grading system in current use, permitting a number of comparisons within the second half of the study, as well as comparisons with the data obtained earlier from ATJ forms used alone.

In order to secure information needed for valid ride-ride reliability tests, precautions must be taken to insure that the second check pilot does not know the results of the first check ride. A wealth of psychological evidence indicates that it is next to impossible for an individual to resist being biased in his judgments if he knows the judgments of others. In the Stage D tryout the problem of keeping the two check rides independent of each other was relatively easy to meet. This problem was considerably more complex in Stage A, however, where a solo flight normally follows a satisfactory check flight. The procedures used for maintaining independence of the two successive check rides of the test are outlined below.

In the Stage D tryout the problem of keeping the two check rides independent was dealt with as follows:

1. Instructors were asked not to reveal the results of check rides under any conditions.

2. Students were not given a post-flight briefing session following the first ride and were never informed of the result of the first ride.

3. The students' flight jackets containing daily grade slips and check flight grades were not available to either check pilot.

The workability of these procedures depended to some extent upon the cooperation of the check pilots conducting the tryout. All indications pointed to the fact that this cooperation was satisfactory in Stage D.

Because of the fact that students in Stage A normally make a brief solo flight toward the end of a successful A-19 check flight period, the problem of insuring independence of the two successive check rides offered many difficulties. If the student soloed on his first check flight, it seemed unlikely that he would fail to reveal this fact to his second check pilot, either directly or indirectly. It was, therefore, decided that students would not be soloed until the end of their second A-19 check, and then only if both checks had been satisfactory.

In order to accomplish this plan, the following precautions were taken in addition to those described for Stage D. The second check pilot carried a sealed envelope containing the result (up or down) of the first hop. He was instructed to open the envelope only after he had decided the student was ready to solo. If, toward the end of the period, the check pilot had decided the student should get a down, he returned to the home field and turned in the sealed envelope.

This procedure was not foolproof, and did not insure complete independence of the two check rides in all cases. The main source of weakness in the system is the fact that ATJ forms are filled out after the flight is completed. Thus, a pilot who awarded an up on the second check, and opened the envelope to find out whether he could solo the student, knew whether the first hop was satisfactory or unsatisfactory before he wrote up his report of the flight. This fact makes it possible that the ATJ grades were not completely independent from one ride to the other in Stage A.

This lack of independence applies only to the ATJ scores in Stage A. It does not apply to Stage D ATJ scores, nor to scores on the objective grading booklets since these forms were marked in the air during the flight.

Before the experimental tryout was begun, it was necessary to indoctrinate instructors in the use of the objective grading forms. For the Stage A tryout, a panel of 25 experienced instructors was selected from each of the two fields in BTU-1, i.e., North Whiting Field and South Whiting Field. At BTU-2, a group of approximately seventy instructors conducted the check flights since the scheduling situation for Stage D made it infeasible to restrict check flights to a smaller number of instructors. In both Stage A an. Stage D all check pilots who participated in the tryout had been active members of their respective units for at least five months. The indoctrination in objective grading was conducted as follows:

All check pilots attended an introductory lecture by a representative of The Psychological Corporation in which the overall aims of the project were outlined and general principles of objective grading were discussed. This lecture was given during the early stages of the project and before the check flight forms were developed. After the check flight forms were completed, the panel of instructors was called together for another lecture on the specific ways to use the A-19 and D-11 objective check flight forms. At the beginning of this lecture, copies of the check flight forms were distributed to all check pilots. The lecture consisted of a general discussion of the problems of objective, in-flight grading, combined with specific reference to the ways in which particular maneuvers were to be graded. The instructors kept personal copies of the check flight forms and were instructed to study them at their leisure. Copies of the instructor's manual were also provided. Approximately one week following this lecture the instructors attended an additional informal question and answer session on the use of objective check flight and received a general briefing on the conduct of the experimental tryout.

The next phase in instructor indoctrination involved informal practice periods in the air using the objective grading booklets. Instructors were requested to take as many practice flights as they felt necessary in order to become familiar with grading under the new system. All instructors were required to take at least one practice flight before using the check flight form with a student to be included in the experiment.

No attempt was made at either unit to insure that each instructor participating in the tryout conduct an equal number of check flights.

Students at both units were informed of the overall purpose of the project and of the role that they were to play in the conduct of the experiment. This was accomplished by lectures and mimeographed handouts. It was particularly desirable to indoctrinate the students in regard to the two-out-of-three check flight system which was used. The students were informed that their progress through the stage would now depend on the results of two successive check flights as compared to the usual one. They were also informed of the necessity for keeping the results of the first check ride secret until the second check flight had been completed. It was also explained that there could be no post-flight briefing following the first hop.

Data for the first half of the experiment were collected during November and December, 1951. Data for the second half of the experiment, in which the objective grading forms were used, were collected during January and February, 1952.

<u>The Problem of In-Flight Marking</u>

The major practical difficulty of objective in-flight grading is the division of attention required of a check pilot in marking the form. This problem is particularly acute when, as in the present study, the check pilot must also act as safety pilot.

Special grading form holders were devised in an attempt to minimize the difficulties. An illustration of the knee pad used in Stage A is presented in Figure 1. The device used in Stage D was similar, but fitted on the right side of the cowl above the

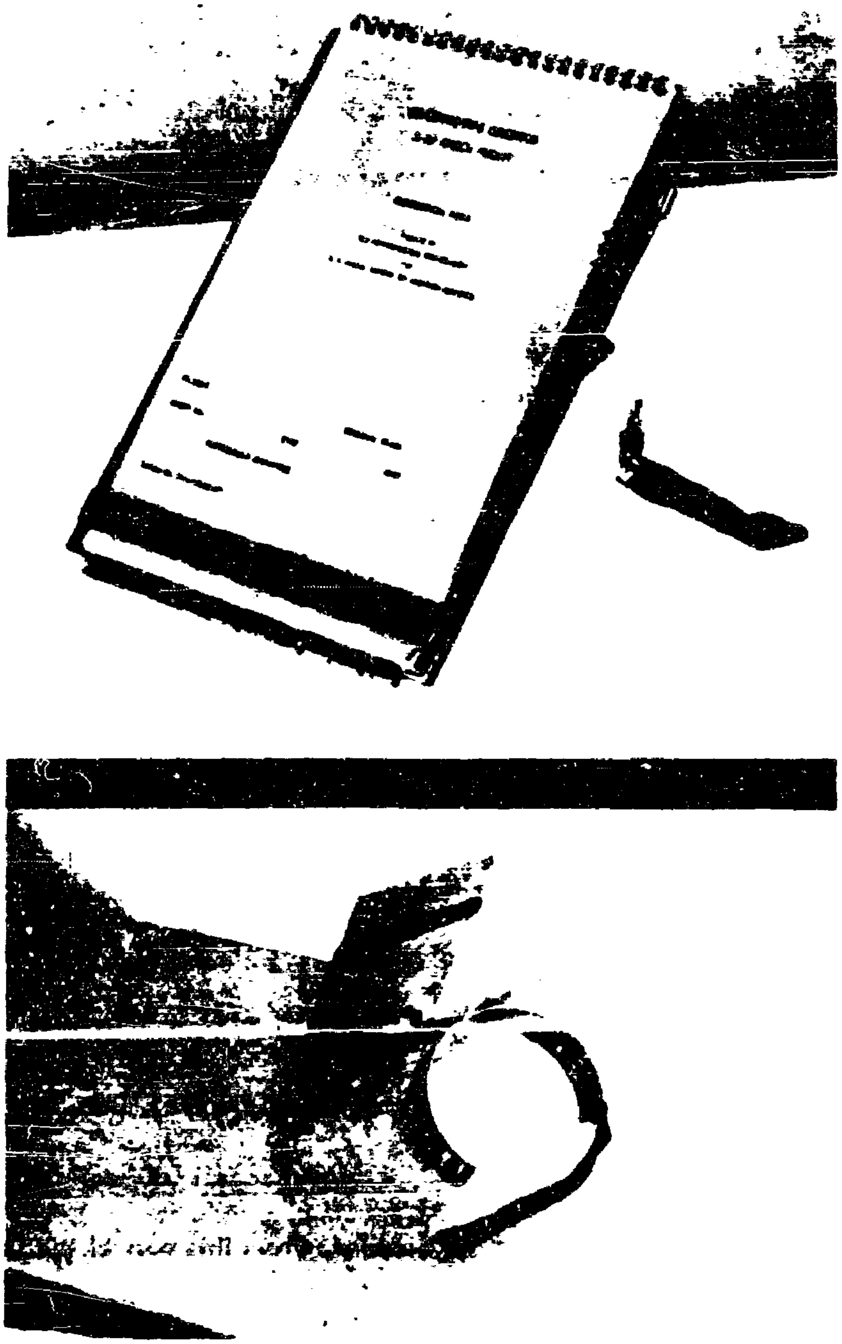


Figure 1. Stage A check flight booklet holder. Top view shows the holder with booklet in place. The elastic bands hold the booklet in place and prevent the pages from fluttering in the wind. Bottom view shows the holder partially opened. The leaf arrangement allowed for securing already marked pages between the leaves in a one-hand operation. The Stage D holder was identical except for the leg band which was replaced by a cockpit mounting bracket.

instrument panel in the front cockpit of the SNJ. Pilots reported some advantage in having the grading form at eye level since it allowed them to maintain a fairly uninterrupted scan of the instruments and the grading booklet while maintaining an adequate lookout for other aircraft.

The grading form holder was not mounted at eye level for the Stage A tryout because no suitable place was found in the rear cockpit, the instructor's station in Stage A.

Scoring the Form

As previously indicated, the completed check flight forms included a large number of items, each referring to some rather specific aspect of behavior. In order to arrive at a total score for the student's performance, a means of computing and combining item scores had to be devised.

Two simple scoring methods were tried out, each of which resulted in a total score wherein every item in the test could contribute an equal amount. In the first system tried, each item was assigned a score of either 3, 2, or 1 depending upon the performance of the student. In the Stage A booklet, the dotted lines, light lines, and heavy lines indicate these breakdowns of 3, 2, and 1 scores for each item, except those found on the last three pages of the booklet. From this part of the form, only the items on planning, coordination, alertness for other traffic, use of trim tabs, initiative, emotional tension, and airsickness were used in determining the student's overall grade. These items were also scored 3, 2, or 1 in the first scoring system used.

In the case of Stage D, scores of 3, 2, and 1 were assigned on the basis of similar performance tolerances, although the check flight form itself is not so marked in the case of all items. Items in the Stage D form which are not marked as to limits were scored according to the following tolerances:

Heading Items

Score	Tolerances
3	within plus or minus 5 degrees
2	between plus or minus 5 and 10 degrees
1	over plus or minus 10 degrees

Altitude Items

Score	Tolerances
3	within plus or minus 50 feet
2	between plus or minus 50 and 100 feet
1	over plus or minus 100 feet

Air Speed Items

Score	Tolerances
3	within plus or minus 5 knots
2	between plus or minus 5 and plus or minus 10 knots
1	over plus or minus 10 knots

Timing Items

Score	Tolerances
3	within plus or minus 10 seconds
1	over plus or minus 10 seconds

Manner of Correcting Items

Score	Tolerances
3	prompt, and smooth
2	slow, and uneven
1	never, and rough

The most direct way of calculating a student's total score from the scores made on individual items would be a simple addition of the item scores. This would be a very satisfactory method provided all items in the objective grading booklet were marked by the check pilots. As it turned out, however, nearly all booklets had a few omissions, which necessitated using a total score based upon the student's average performance on all items which were marked. This score was very easily arrived at by adding the individual item scores and dividing by the total number of items marked. In this manner, a student's score was not lowered by the failure of his check pilot to mark an item.

The second method of scoring was a simplification of the first described above. In this method each item was scored either 1, or zero, with the same performance limits used for a score of 1 as those used in the previous method for the score of 3. As in the earlier method, the total score was obtained by summing the scores made on individual items and dividing by the number of items marked. These "percentage" scores were then multiplied by the number of items contained in the form, or in the case of subtask scores, by the number of items contained in the subtask.

In order to determine whether scoring by one or the other of the above methods made any appreciable difference in the relative standing of students, a correlation was run between scores resulting from the two methods. This analysis, performed on the Stage A data, resulted in a correlation of .98 between the scores derived from the two scoring systems. Since a correlation of this magnitude between the two sets of scores indicates that practically identical results will be obtained with either scoring system, the simpler 1-0 method was used in all subsequent analyses. All reliability coefficients reported here for objective grading data, except for the tetrachoric correlations, are based on scores derived by the 1-0 method.

The scoring system currently used with ATJ forms is similar to that described above for the objective grading booklets in that each item on the form contributes an equal amount to the total score. In the case of the ATJ forms, however, a given item may refer to a whole series of maneuvers, such as a series of landings, while in the case of the objective grading booklet, each maneuver is graded by a whole series of items. This makes for an important difference in the amount that different maneuvers contribute to the total score in the case of the two grading systems.

In the course of developing the objective grading forms an attempt was made to include an item for every important aspect of check flight behavior which was considered measurable. This approach resulted in a grading form which contains many more items on maneuvers considered to be important than maneuvers considered relatively unimportant by instructors in the training units involved. As a result, the total score on the objective grading form is probably a more meaningful estimate of the student's overall ability than is the total score derived from ATJ grading forms.

In order to discover whether the different parts of the objective check flight forms contributed as much to the total score as the instructors thought proper, a survey of instructor opinion was made. The results are presented in Table 3.1. An inspection of this table reveals that instructor opinion regarding the relative importance of different parts of the check flight agrees fairly well with the actual percentages of the total number of items devoted to the various parts in the objective grading form. Thus, the

TABLE 3.1

ACTUAL AND DESIRED MANEUVER WEIGHTS FOR COMPUTING TOTAL SCORE

STAGE A

	Instructors' opinion (average)	Actual percentage in booklet
High Work	17%	15%
Landings and Takeoffs	44%	63%
Emergencies	14%	6%
Patterns and Procedures	17%	14%
Attributes	8%	2%
	100%	100%

STAGE D

	Instructors' opinion (average)	Actual percentage in booklet
Turn Pattern	15%	20%
Charlie Pattern	40%	54%
Unusual Attitudes	20%	11%
Practical Problem	25%	15%
	100%	100%

assignment of equal weights to all items in the check flight forms results in a "naturally weighted" total score reasonably close to that felt to be optimum by instructors engaged in teaching these phases.

Because the forms were marked in the air as the performance occurred, it was necessary to set up special rules for scoring to be followed in cases where the student's performance on a particular maneuver was interrupted. This problem was particularly acute in Stage A where wave-offs from landings frequently occurred, but had to be dealt with in Stage D also where a maneuver was sometimes interrupted because of danger of entering a cloud, etc.

To meet this problem a distinction was made between interruptions caused by student errors (overshooting on landing, plane out of control in Stage D unusual attitude maneuver, etc.) and interruptions caused by factors beyond the student's control (getting cut out of the traffic pattern in Stage A, danger of colliding with another aircraft in Stage D, etc.). For all interruptions of maneuvers, instructors were required to mark the form to indicate whether or not the student was at fault. In cases where a student error caused the interruption, all items omitted because of the interruption were scored zero. Where the student was not in error, the omitted items were assigned the average value of scores made on items in the maneuver marked before the interruption.

Chapter IV

RESULTS

The General Approach Used in the Analysis

In keeping with the purposes of the project and the design of the experimental tryout, the major emphasis in the statistical analysis was on the comparison of the reliability of scores derived from objective grading check flight forms with scores derived from the currently used ATJ check flight forms. Other analyses were made, however, in order to provide a more complete comparison of the two types of grading.

In the presentation of the results of the experimental tryout, the following topics will be included:

1. Distribution of scores from the two grading forms.
2. Ride-ride reliability between first and second check rides, based on overall scores.
3. Reliability of up-down awards.
4. Relationship between up-down awards and total scores from the two forms.
5. Split-half reliabilities of the two forms based on:
    a. Randomly selected halves.
    b. Identical, or similar portions of maneuvers.
6. Analysis of subtasks in terms of:
    a. Distribution of scores.
    b. Interrelationships.
    c. Ride-ride reliabilities.
7. Relationship between ATJ and objective scores for the same check flight assigned by the same check pilot.

In addition to the above, an item analysis was performed on the Stage A data in order to provide more detailed information for evaluation of the objective grading form.

STATISTICAL FINDINGS

Distribution of Scores

As a preliminary to any statistical analysis, it is usually desirable to plot the distribution of scores to be dealt with in order to inspect the distributions for normality, and to obtain the means and standard deviations.

Six separate distributions of scores were obtained in the tryouts at each training unit. Two distributions arise from the scores made by students on the two check rides where the ATJ grading system was used alone, two distributions arise from the scores made by students on the ATJ grading forms in the second half of the experiment, and finally, two distributions arise from the scores made by the students on the objective booklets on the two successive check rides of the second half of the experiment.

The summary statistics of the distributions of scores are given in Table 4.1. Since inspection of the distributions revealed no serious deviations from normality, no rigorous statistical tests for skewness or kurtosis were felt to be necessary.

Ride-ride Reliabilities of Total Scores

The most meaningful statistic with which to report the overall results of the experiment is the ride-ride reliability coefficient calculated from the total scores of the grading forms. These coefficients of correlation are given in Table 4.2. Inspection of this table reveals that the correlations are low; however, they are all significantly different from zero, indicating that some degree of consistency exists between grades

TABLE 4.1

MEANS AND STANDARD DEVIATIONS
OF TOTAL SCORES

STAGE A

	ATJ used alone Total score		ATJ used with objective grading		Objective total scores	
	A19X*	A19AX*	A19X	A19AX	A19X	A19AX
Mean	49.94	50.91	53.54	53.97	203.52	206.14
S. D.	4.93	4.47	5.72	4.81	32.41	34.99
N	109	109	112	112	112	112

STAGE D

	ATJ used alone Total score		ATJ used with objective grading		Objective total scores	
	D11X*	D11AX*	D11X	D11AX	D11X	D11AX
Mean	45.43	47.64	48.00	49.57	134.85	135.06
S. D.	6.05	5.48	5.70	4.59	20.21	19.80
N	110	110	108	108	108	108

* A19X and D11X are the standard symbols used for the check flights in Stage A and Stage D respectively. The symbols, A19AX and D11AX are used to designate the second check flights which were flown for the purposes of the tryout.

TABLE 4.2

RIDE-RIDE RELIABILITIES BASED ON
TOTAL SCORES

STAGE A

	r	$S.E._{r_o}$	N
ATJ used alone	.43	.0958	109
ATJ used with objective grading	.50	.0944	112
Objective grading booklet	.31	.0944	112

STAGE D

	r	$S.E._{r_o}$	N
ATJ used alone	.42	.0953	110
ATJ used with objective grading	.41	.0962	108
Objective grading booklet	.33	.0962	108

on the first and second check flights in the case of both grading methods.

The comparison of major interest in this investigation is that between the reliability of ATJ forms used alone and the reliability of the newly developed objective grading forms. The differences between these reliabilities (.12 in Stage A and .09 in Stage D) favor the ATJ form in both stages, although they do not reach acceptable levels of statistical significance in either case. These are the most important findings of the analysis and indicate that the attempt to improve the ride-ride reliability of the A-17 and D-11 check flights by means of objective grading forms was unsuccessful.

Table 4.2 also shows that in Stage A the reliability of the ATJ appears to be greater when used with objective grading than when used alone. Again, this difference (.50 - .43 = .07) is small enough to be accounted for easily by chance, but it is nevertheless suggestive.

The only comparison in Table 4.2 which yields a difference approaching acceptable statistical significance is that between the reliability of ATJ used with objective grading in Stage A and that of the objective grading booklet itself. A difference this large (.50 - .31 = .19) could have occurred by chance less than 10 times in 100,* but this finding cannot be taken by itself to indicate that the ATJ is more reliable than the objective booklet. This point is discussed further in the next chapter.

---

* This estimate of significance is based on the standard error of the difference without consideration of the possible correlation existing between $\underline{r}$'s. It is likely, then, that the true probability of occurrence of a chance difference this large is considerably less than this estimate.

Reliability of Up-Down Awards

The most appropriate statistic with which to describe the strength of relationship between performance on one ride and the other, dealing only with the categories of pass and fail on the two rides, is the tetrachoric correlation coefficient. This coefficient of correlation is computed from data consisting of the percentages of the cases falling into each of the four possible categories as a result of the assignment of up or down to either check. In order to calculate a dependable coefficient of correlation in this manner it is necessary that the percentages in all cells of the fourfold table, such as those in Table 4.3, be large enough to permit a reasonably accurate reading from the computing diagrams. In the Stage D data, too few students were assigned downs to meet this requirement; hence, the computation of a tetrachoric coefficient of correlation from these data would have been undependable. The frequency of down awards at Stage A, however, allowed for the computation of a more dependable tetrachoric correlation coefficient. Table 4.3 gives the percentages for both stages and the resulting correlations for Stage A.

Here, a fairly large difference appears between the reliability of up-down awards in the first half of the experiment (ATJ used alone) and their reliability in the last half (ATJ used with objective grading). The obtained difference (.25) probably reveals a real increase in the consistency with which ups and downs were awarded in the second half of the experiment. It is not possible to obtain an exact estimate of the dependability of a difference between tetrachoric correlations, but there are ways of approximating it. One way is to take into account the fact that the sampling fluctuation of

TABLE 4.3

PERCENTAGES OF UP AND DOWN AWARDS

STAGE A

ATJ used alone

A-19X

		DOWN	UP	TOTAL		
A-19AX	UP	22.9	42.2	65.1		
	DOWN	22.1	12.8	34.9	r_{tet}	= .41*
	TOTAL	45.0	55.0	100.0	N	= 109

ATJ with objective grading

A-19X

		DOWN	UP	TOTAL		
A-19AX	UP	15.9	48.7	64.6		
	DOWN	24.8	10.6	35.4	r_{tet}	= .66*
	TOTAL	40.7	59.3	100.0	N	= 112

* Computed from the Thurstone Tables.

TABLE 4.3

PERCENTAGES OF UP AND DOWN AWARDS

STAGE D

ATJ used alone

D-11X

		DOWN	UP	TOTAL	
D-11AX	UP	14.5	74.5	89.0	
	DOWN	5.5	5.5	11.0	N = 110
	TOTAL	20.0	80.0	100.0	

ATJ with objective grading

D-11X

		DOWN	UP	TOTAL	
D-11AX	UP	14.8	76.9	91.7	
	DOWN	2.8	5.5	8.3	N = 108
	TOTAL	17.6	82.4	100.0	

tetrachoric r can be as much as 50% greater than Pearson r (5, p. 335) and treat the difference as if it had been obtained from Pearson r's whose S.E.'s were one and one half times as large as normal. This yields a conservative estimate of the significance of the obtained difference. In the present case, the results of such a computation show that the difference of .25 between the obtained tetrachoric r's could have occurred by chance only 12 times out of 100.

This finding suggests that the reliability of awarding ups and downs by ATJ forms improved in the last half of the experiment. The question of whether this increase in reliability must be attributed to the concurrent use of objective grading or to other factors will be discussed in the following chapter.

<u>The Relationship Between the Grades of Up and Down to the Total Score</u>

One of the differences between the currently used A-19 check flight and the usual standardized selection or progress test is that the decision of pass-fail, or in this case, "up-down," is not determined from a definite cut-off point on the score continuum. Rather, it is made on the basis of the check pilot's overall judgment as to whether the student is "safe for solo." It is entirely possible, particularly in Stage A, for a student to fly an excellent check flight in all respects with the exception of one crucial maneuver on which he exhibits dangerous behavior. In this case, the student might get a fairly good overall grade, but nevertheless be awarded a "down."

In order to determine whether the decision of the check pilot in regard to "up" or "down" bore any very significant relationship to the total score made by the student, biserial correlation coefficients were computed from the Stage A data and are presented in Table 4.4. Again, the Stage D data are so unbalanced in terms of percentages of ups and downs that a correlation computed on them would be of doubtful dependability.

The biserial coefficients are all rather high and indicate that there is a strong tendency for students who are judged "safe for solo" to get high grades, and for those judged "unsafe for solo" to get low grades, particularly when the grades are awarded on the basis of ATJ forms used alone. This tendency appears to be less strong when the total score is based on ATJ forms used with objective grading, and even weaker when the total score is derived from the objective grading booklet.

Split-half Reliability

Although the ride-ride reliability data presented above should serve as the primary means of evaluating the two grading systems under comparison, other types of reliability measures provide valuable information. One such measure is split-half reliability. Computation of this statistic involves splitting the completed check flight form into two comparable halves and calculating a correlation coefficient between the scores on the halves.

By assigning the items to two groups by the toss of a coin, two approximately equivalent check flight forms of half the original length were devised. A correlation between these half-tests -- the split-half reliability -- is an indication of the consistency of equivalent forms recorded at the same time by the same check pilot. By means of a simple computation, the resulting correlation coefficient may be corrected for the decrease in length of the form caused by splitting it into two halves.

In both Stage A and Stage D split-half reliabilities were computed for the objective grading booklets. These analyses revealed for the Stage A booklet a split-half

TABLE 4.4

BISERIAL CORRELATION COEFFICIENTS BETWEEN
UP-DOWN AWARDS AND TOTAL SCORES

	A-19X		A-19AX	
	r_{bis}	N	r_{bis}	N
ATJ used alone	.88	109	.89	109
ATJ with objective grading	.83	112	.84	112
Objective grading	.72	112	.72	112

reliability coefficient of .95 when corrected for length by the Spearman-Brown formula, and for the Stage D booklet a corrected split-half reliability of .69. This indicates in both cases a very high degree of "internal" reliability for the objective check flight forms.

Split-half analysis of objective grading data was based on 25 cases randomly selected from the first check flight.

In order to obtain split-half reliability information for the ATJ grading forms, a slightly different method of selecting the two halves of the form was employed. Since the ATJ form contains only 18 items in Stage A and 16 in Stage D, a perfectly random split made by the toss of a coin might result in a division heavily weighted on one side by maneuvers of one type, and on the other side by maneuvers of another type. It was therefore decided to split the ATJ form in such a way as to make each half appear to be approximately equivalent in terms of maneuvers.

The division of items in the Stage A ATJ form into two halves resulted in assigning the items in the following way:

1st Half	2nd Half
Cockpit Check	Level Flight
Turns	Taxiing
Transitions	Takeoffs
Landing Pattern	Slow Flight
Landings	Stalls
Spin	Approaches
Emergencies	Cross Wind Landings
Headwork	Air Discipline
Reaction to Flight	Mental Attitude

The division of the Stage D ATJ form into two halves resulted in assigning the items in the following way:

1st Half	2nd Half
Full Panel	Full Panel
Nose Position	Wing Position
Transitions	Standard Rate Turns
Turn Pattern	Charlie Pattern
Partial Panel	Partial Panel
Nose Position	Wing Position
Transitions	Timed Turns
Practical Problem	Unusual Attitudes
Attributes	Attributes
Headwork	Air Discipline
Reaction to Flight	Mental Attitude

The correlation between the halves of the Stage A ATJ form selected in this way was .63* which, when expanded to the original length by the Spearman-Brown formula, becomes .77. The correlation between the halves of the Stage D ATJ form selected in this way was .68 which, when expanded to the original length by the Spearman-Brown formula becomes .81. Split-half reliabilities of this magnitude indicate that these forms have considerable internal reliability.

The fact that the objective grading form includes certain repetitions of maneuvers and portions of maneuvers made it possible to compute the reliability of some parts of the check flight form in terms of the consistency with which the same check pilot grades similar maneuvers at different times during the flight. In all, five separate analyses of this type were made on splits as described below.

In Stage A the student is required to make eight landings: three crosswind, four

---

* These correlations are based on data from the first check flight graded by ATJ alone for all 109 cases.

into the wind, and one final landing at the home field. He is also required to enter the traffic pattern of two different outlying fields using the standard field entry procedure. In Stage D three of the maneuvers involve sufficient repetitions of parts to provide for the same type of analysis. In the Turn Pattern, six turns are required, and may easily be broken down into two groups. Charlie Pattern includes four turns and four straight legs. Turns and straight legs were assigned to one half or the other on the basis of similarity of requirements, such as transitions, climbs, descents, etc. Under partial panel conditions the student is required to recover from four unusual attitudes, and the division was made so that two recoveries were assigned to each half.

Table 4.5 gives the split-half reliabilities for the maneuvers described above. These correlations, based on selected parts of the form, do not, of course, give an indication of the reliability of the entire form, but do provide valuable information on the consistency of grading at different times during the same flight.

Analysis of Subtasks

Two major types of information may be derived by dividing the total check flight into subtasks and analyzing them as separate parts of the entire check. First, it can be determined whether the different parts of the check measure the same or different skills, and second, it can be discovered whether some parts of the check flight are graded more reliably than others. Information on both of these points was obtained in the present study and will be presented following a description of the subtasks into which the check flights were divided.

Distribution of Scores on Subtasks Within the A-19 Check Flight

The subtasks into which each check flight form was divided are listed in Table 4.6.

TABLE 4.5

SPLIT-HALF RELIABILITIES OF MANEUVERS GRADED ON THE OBJECTIVE FORM

STAGE A

Maneuver	r	corrected r*	N
Landings	.78	.88	25**
Standard Field Entry	.56	.72	25

STAGE D

Turn Pattern	.67	.80	25
Charlie Pattern	.71	.83	25
Unusual Attitudes	.66	.80	25

* Corrected for double length.

** Because of the computational labor involved in rescoring each booklet, these analyses were made on a randomly selected sample of 25 cases from the first check flight only.

TABLE 4.6

MANEUVERS COMPRISING EACH SUBTASK OF THE GRADING FORM

ATJ Grading Forms

STAGE A

Subtasks	Maneuvers
Patterns and Procedures	Cockpit check Taxiing Air discipline
Landings and Takeoffs	Takeoff Landing Pattern Landings Approaches Cross Wind landings
High Work	Turns Slow flight Transitions Stalls Spin Level flight
Attribute	Reaction to flight Headwork Mental Attitude

STAGE D

Subtasks	Maneuvers
Full Panel Less Patterns	Nose position Wing position Transitions Standard rate turns
Full Panel Patterns	Turn pattern Charlie pattern
All Full Panel	Nose position Wing position Transitions Standard rate turns Turn pattern Charlie pattern
Partial Panel Less Patterns	Nose position Wing position Transitions Timed turns
Partial Panel Patterns	Unusual attitudes Practical problem
All Partial Panel	Nose position Wing position Transitions Timed turns Unusual attitudes Practical problem
Flight Attitudes	Nose position Full Panel Partial Panel Wing position Full Panel Partial Panel Transitions Full Panel Partial Panel
Pattern Total	"C" pattern Turn pattern Unusual attitudes Practical problem

TABLE 4.6

MANEUVERS COMPRISING EACH SUBTASK OF THE GRADING FORM

Objective Grading Forms

STAGE A

Subtasks	Maneuvers
Patterns and Procedures	Pre-flight and Taxiing Standard Field Entry Traffic Entry and Pattern at Home Field
Landings and Takeoffs	Initial Takeoff and Field Departure 500' Pattern Touch and Go Landings Final Landing
Emergencies	High Altitude Emergencies Low Altitude Emergencies
High Work	Steep Turns Slow Flight Stalls Spins
Attributes	Planning Coordination Alertness for other Traffic Use of Trim Tabs Initiative Emotional Tension Airsickness

STAGE D

Subtasks
"C" Pattern
Turn Pattern
Unusual Attitudes
Practical Problem

One further breakdown of subtasks in the case of the Stage A objective booklet was the separation of the 500' Pattern Touch and Go Landing page into two sections for scoring. These sections were so selected that the one referred to as "Left-half" included only the climb out of the field, the pattern around the field, and the approach; the other, referred to as "Right-half," included those items from touchdown to takeoff, or in effect, the items most directly concerned with the actual landing and ground control of the aircraft. This division was felt to offer promise in the analysis since many students were reported to have difficulty in one phase, but not in the other.

Table 4.7 gives the subtasks, with the means, standard deviations, and ride-ride reliabilities obtained in the analysis.

<u>Ride-ride Reliabilities of the Subtasks</u>

The measures of ride-ride reliability presented so far have had to do with the extent to which the entire first check flight predicts the outcome of the second. It is also desirable to know whether some particular maneuvers, or groups of maneuvers, provide a more stable score from one ride to another. In order to obtain information on this point, the ride-ride reliabilities of subtasks presented in Table 4.7 were computed.

The correlations in Table 4.7 indicate that some subtasks of the objective grading form are definitely graded more reliably than others, while differences among subtask reliabilities of the ATJ form are less apparent. In the Stage A objective data the subtasks, Patterns and Procedures, and Emergencies do not have ride-ride reliabilities significantly different from zero. Patterns and Procedures also has the lowest ride-ride reliability of any subtask measured by the ATJ form, but it is significantly different

TABLE 4.7

MEANS, STANDARD DEVIATIONS, AND RIDE-RIDE RELIABILITIES OF THE SUBTASK SCORES

STAGE A

ATJ used alone

	A-19X		A-19AX		
	M	S.D.	M	S.D.	r_{X-AX}
Patterns and Procedures	8.44	1.[illegible]9	8.58	0.88	.19
Landings and Takeoffs	12.77	2.55	13.48	2.49	.34
High Work	17.37	1.80	17.37	1.65	.23
Attributes	8.70	0.94	8.84	0.98	.23
Maneuver Total	38.64	4.11	39.39	3.81	.42
Grand Total	49.94	4.93	50.91	4.47	.43

N = 109
$S.E._{r_0}$ = .0958

ATJ used with objective grading

	A-19X		A-19AX		
	M	S.D.	M	S.D.	r_{X-AX}
Patterns and Procedures	8.34	1.29	8.61	1.04	.19
Landings and Takeoffs	13.13	2.54	13.05	2.39	.51
High Work	17.46	2.39	17.29	1.83	.29
Attributes	8.89	1.09	9.04	1.00	.31
Maneuver Total	42.07	4.62	42.14	4.11	.50
Grand Total	53.54	5.72	53.97	4.81	.50

N = 112
$S.E._{r_0}$ = .0944

TABLE 4.7

MEANS, STANDARD DEVIATIONS, AND RIDE-RIDE RELIABILITIES OF THE SUBTASK SCORES

<u>Objective Grading Form</u>

	A-19X		A-19AX		
	M	S.D.	M	S.D.	r_{X-AX}
Patterns and Procedures	30.43	4.90	30.73	5.39	.07
Left Half Landings	63.70	13.11	65.70	16.86	.21
Right Half Landings	53.18	12.70	53.64	12.05	.39
Takeoff and Landings	124.86	23.57	126.98	27.25	.31
Emergencies	12.48	2.37	12.18	2.35	.01
High Work	31.37	5.98	31.88	5.24	.30
Attributes	3.62	1.93	3.79	1.86	.29
Total	203.52	32.41	206.41	34.99	.31

N = 112
$S.E._{r_o} = .0944$

TABLE 4.7

MEANS, STANDARD DEVIATIONS, AND RIDE-RIDE RELIABILITIES OF THE SUBTASK SCORES

STAGE D

ATJ used alone

	D-11X		D-11AX		
	M	S.D.	M	S.D.	r_{X-AX}
Full Panel (less patterns)	11.67	2.11	12.28	1.94	.22
Full Panel Pattern Total	5.61	1.28	6.05	1.13	.18
Full Panel Total	17.28	3.11	18.33	2.86	.28
Partial Panel (less patterns)	10.86	2.40	11.23	2.11	.39
Partial Panel Pattern Total	5.05	1.25	5.42	1.17	.37
Partial Panel Total	16.06	3.32	16.87	3.33	.41
Flight Attitude Total	22.54	3.69	23.51	3.34	.42
Pattern Total	10.66	2.02	11.46	1.76	.34
Maneuver Total	33.42	5.33	35.07	4.75	.44
Attributes	12.01	1.21	12.61	1.10	.07
Grand Total	45.43	6.05	47.64	5.48	.42

N = 110

$S.E._{r_0}$ = .0953

TABLE 4.7

MEANS, STANDARD DEVIATIONS, AND RIDE-RIDE RELIABILITIES OF THE SUBTASK SCORES

<u>ATJ used with objective grading</u>

	D-11X		D-11AX		
	M	S.D.	M	S.D.	r_{X-AX}
Full Panel (less patterns)	12.26	1.92	12.95	1.50	.37
Full Panel Pattern Total	6.24	1.15	6.36	.94	.25
Full Panel Total	18.50	2.81	19.33	2.16	.41
Partial Panel (less patterns)	11.73	1.90	11.93	1.85	.26
Partial Panel Pattern Total	5.54	1.40	5.69	1.27	.29
Partial Panel Total	17.27	3.02	17.60	2.81	.37
Flight Attitude Total	23.99	3.14	24.88	2.70	.37
Pattern Total	11.78	2.04	12.06	1.69	.36
Maneuver Total	35.62	5.28	36.95	4.06	.39
Attributes	12.40	1.31	12.62	1.04	.14
Grand Total	48.00	5.70	49.57	4.59	.41

N = 108
$S.E._{r_o}$ = .0962

TABLE 4.7

MEANS, STANDARD DEVIATIONS, AND RIDE-RIDE RELIABILITIES OF THE SUBTASK SCORES

<u>Objective Grading Form</u>

	D-11X		D-11AX		
	M	S.D.	M	S.D.	r_{X-AX}
Turn Pattern	31.49	4.12	31.36	3.89	.11
Charlie Pattern	76.12	12.99	76.38	11.89	.35
Unusual Attitudes	10.94	4.44	11.59	4.39	.21
Practical Problem	15.51	4.78	15.25	5.22	.16
Total	134.85	20.21	135.06	19.80	.33

N = 108
$S.E._{r_o} = .0962$

from zero at the .05 level of confidence. Reliability of ATJ Emergencies could not be obtained in this analysis since emergencies are covered by only one item in the ATJ form, thus imposing a severe restriction on the possible range of scores for the subtask.

In the Stage D objective data, neither Turn Pattern nor Practical Problem reveals a significant ride-ride reliability, while Charlie Pattern seems to be as reliable as the entire form. The only subtask reliability of the ATJ Stage D check flight which does not differ significantly from zero is Attributes.

Intercorrelations of the Subtasks

In the measurement of a complex skill such as flying, it is desirable to know whether the different parts of the "examination" measure the same fundamental skill, or different skills which are independent of each other. This may be discovered by comparing the correlations between the various parts. If these tend to be high, it means that the parts tend to measure the same thing. If they tend to be low, the meaning is that separate skills are measured by the different parts of the check flight.

For the benefit of the technical reader, complete intercorrelation tables are presented for Stage A and Stage D in Appendix C. Those who wish to interpret these relationships are cautioned to check the content of the subtasks, particularly in Stage D, since certain of them are portions of larger ones. Corrections for part-whole correlation were made only in the correlations between subtasks and total score.

Relationship Between ATJ and Objective Scores Assigned by the Same Check Pilot

In the second half of the experimental tryout, when the student was graded on both the ATJ form and the objective grading form, data were collected which allowed for the computation of measures of agreement between the two types of form. The most general indication of the agreement of the scores derived from the different forms is the correlation between total scores.

In Stage A the correlation between the ATJ and the objective scores was .77 on the first check flight and .76 on the second. In Stage D these correlations were .65 on the first and .61 on the second. This indicates that the two grading forms are measuring much the same thing, but the agreement between them is by no means perfect.

Since certain subtasks of the Stage A objective grading form are very similar to the subtasks of the ATJ form, correlations between these similar subtasks were computed to discover the agreement between subjective and objective ratings of essentially the same maneuvers. These correlations are presented in Table 4.8. Again it is apparent that considerable agreement exists between ATJ and objective scores.

<u>Item Analysis of the A-19 Objective Check</u>

When a newly constructed test is tried out for the first time, it is nearly always true that some items in the test are good and some items in the test turn out to be bad. One indication of the quality of an item is the contribution it makes to the overall score of the test. A good item is one which makes a significant contribution to the overall score, while a bad item is one which makes either no contribution or is actually negatively correlated with the total score.

The two statistics which are ordinarily used to evaluate items in a test are, (a) a correlation coefficient calculated for each item against the total score to determine the item's contribution to that score, and (b) a percentage of subjects in the sample

TABLE 4.8

CORRELATIONS BETWEEN SIMILAR SUBTASKS OF THE ATJ AND OBJECTIVE GRADING FORMS

Subtasks	r (A-19X)	r (A-19AX)
Takeoffs and Landings	.68	.69
High Work	.63	.54

N = 112

who pass the item, which reveals the level of difficulty. Ideally, a standardized measuring instrument should have a good selection of items in terms of difficulty level, ranging from very difficult items to very easy ones. The majority of the items should be of medium difficulty so that approximately half the people tested pass the item while approximately half fail. Also, if people who pass a particular item tend to be people who make high scores on the overall test, and people who fail the item tend to be those who make low overall scores, the item will have positive correlation with the total score and thereby be revealed as a good item. The strength of this tendency, as revealed by the correlation coefficient, gives an indication of how good the item is.

The general plan of the item analysis involved dividing the total sample of cases into two parts. The item correlations were computed using one part, while the items revealed as having acceptable qualities in terms of the analysis were treated as a shortened form of the test for a ride-ride reliability analysis in the second part of the sample.

The nature of the Stage A check flight form made it necessary to devise certain special procedures which would make it suitable for an item analysis. These are briefly described below.

Since a number of items in the form, particularly those relating to landings, were repeated a number of times during the check flight, it was necessary to select those of the repetitions which would be suitable for analysis. It was decided that in general an item would be analyzed only the first time it appeared in a particular section of the booklet.

The data on which the analysis of items was performed came from the grading booklets of the first flight check taken by all students at North Whiting. Point biserial correlation coefficients were computed for all analyzed items in these booklets using as a criterion the student's combined total score based on the sum of the first plus the second objective check flight.

A few items were not analyzed because their difficulty level was such as to make an analysis inappropriate. In order for an item to qualify for analysis it had to reveal more than 5 per cent of the cases in either the within limits or outside limits category.

The distribution of point biserial coefficients of correlation is given in Table 4.9.

Following the item analysis the 100 "best items" were selected on the basis of the magnitude of the point biserial correlation coefficients of the items. These 100 "best items" made up the content of the shortened version of the test which was then tried out by running an additional ride-ride correlation on the booklets from the field which had not yet figured in the analysis.

Selection of the 100 "best items" resulted in retaining all items having a point biserial correlation of .17 or higher. The ride-ride reliability as computed from 56 pairs of independent check rides performed at South Whiting Field was .25.

All item-criterion correlations obtained in the analysis may be found in Appendix D.

TABLE 4.9

DISTRIBUTION OF ITEM CRITERION CORRELATIONS

r_{pbis}	f	r_{pbis}	f
51	2	16	3
49	2	15	1
48	2	14	4
47	1	13	3
46	1	12	3
45	2	11	4
42	1	10	1
39	2	09	1
38	2	07	3
37	4	06	3
36	4	05	1
35	3	04	4
34	3	03	1
33	3	02	6
32	7	01	1
31	3	00	1
30	6	-01	2
29	1	-02	1
28	6	-03	1
27	3	-04	1
26	4	-07	2
25	3	-08	1
24	5	-09	1
23	3	-11	1
22	3	-12	1
21	6	-14	1
20	8	-15	1
19	1	-17	1
18	4		
17	6		

N = 155

Chapter V

DISCUSSION AND CONCLUSIONS

Major Findings

The main import of the findings is that the objective grading forms developed and evaluated in the present study are no improvement over the ATJ forms which are in current use. In view of the need for improved measures of flying skill, it is important that we examine the possible reasons for this lack of success with objective measures.

The failure to obtain satisfactory ride-ride reliabilities with the objective grading forms may result as much from real day-to-day fluctuations in student performance as from errors in measuring that performance. In his summary of the World War II research done on objective grading in the Army Air Forces, Miller observes that in many cases efforts were made to improve ride-ride reliability, only to find that the low reliability was due to erratic day-to-day fluctuations in performance rather than to errors of measurement (7, p. 361). Observers using objective grading forms tended to agree very well regarding a given performance of a student. Split-half reliabilities of objective grading forms were also consistently high. Low reliability occurred primarily when the observations were made by different check pilots on different days in different airplanes, thus suggesting that the low ride-ride reliability coefficients were due to factors other than errors in measurement.

It seems likely that the same factors operated in the present study. Although the conditions of the tryout afforded no opportunity to obtain measures of observer agreement concerning the same performance, the split-half reliabilities of the objective grading forms are high. If we may suppose that the grading forms used in this investigation are representative of those used elsewhere, it appears that the most likely reason for low ride-ride reliability lies in variability of student performance from one ride to the next.

The relatively low ride-ride reliabilities found in this study are consistent with the results of wartime research in the Army Air Forces, but inconsistent with the results reported by Gordon (4) and Nagay (8) in connection with the tryout of the standard flight check for the airline transport rating. These investigators attribute their success in obtaining high ride-ride reliabilities largely to the fact that the flight check was based on the critical requirements of the airline pilot's job. It is reasoned that performance on the critical aspects of flying is not subject to as much variation from day to day as is performance on less important aspects. This reasoning may be correct in the case of the highly experienced airline pilots who were the subjects of the tryout. However, it may not hold for flight students in training. Thus, the wide difference in amount of flight experience of airline pilots as compared to flight students in the early stages of training could account for the inconsistency in results.

Advantages of Two Safe-for-Solo Checks

In order to obtain stable measures of variable performance, it is necessary to take the average of several measurements. This suggests that more than one check flight would be desirable at the end of crucial stages in training, such as Stage A.

Since the check pilot's decision on the A-19 check flight is a crucial one, it is important that the decision be made with as much accuracy as practicable. Evidence that the accuracy of A-19 decisions is very low at the present time may be found in Table 4.3. In 35.7 per cent of the cases where ATJ forms were used alone, the two check pilots disagreed as to whether the student was safe for solo. If, instead of the check pilot's judgment, we used the toss of a coin to decide the outcome of the two check flights, we should have only 50 per cent disagreement, which is not a great deal more than we now have.

The fact that much of this disagreement may be due to real differences in the student's performance on the two successive rides merely serves to emphasize the importance of measuring his performance more than once. An "up" today <u>should</u> mean that the student will be safe for solo <u>tomorrow</u>, when he is scheduled for his first complete solo period.

It is possible to estimate the increase in reliability obtained by using the same measure more than once. In the case of the A-19 check ride, whose reliability was found to be .43 in the first half of the experiment, the combined scores of the two check rides should produce a reliability of .60. Thus, the use of two check flights instead of one would produce a valuable increase in the accuracy of predictions about future performance.

In a questionnaire administered after the tryout, 92 per cent of the BTU-1 check pilots expressed the opinion that the two-out-of-three check flight system gave a better evaluation of the student's ability. Sixty-five per cent were of the opinion that it would be a good idea to use the system regularly. Eighty-five per cent felt, however, that the students disliked the idea of having to pass two-out-of-three checks.

The instructors' estimate of student opinion, however, was not substantiated in interviews with a sample of 21 students who participated in the tryout at Whiting Field. Sixty-seven per cent of these students reported that they favored the idea of having at least two checks before soloing, and 25 per cent thought it would be a good idea to have multiple checks at the end of every stage.

A check flight not only provides a measure of a student's flying ability; it is also a valuable learning experience for the student. This fact is substantiated in Table 4.1 where the means and standard deviations of total scores for all check rides are presented. In every case, both in Stage A and Stage D, the mean score made on the second check flight is higher than that made on the first. Not all of the differences are large enough to be statistically significant, but the consistent trend in the results furnishes persuasive evidence that higher scores are made on the second check flight than on the first. Since this occurred without students having the benefit of a post-flight briefing between the first and second checks, it is reasonable to suppose that even greater improvement would result from a check flight followed by briefing.

<u>Effect of Objective Grading Upon the Reliability of ATJ Scores</u>

In planning the experimental tryout it was anticipated that the use of objective grading might affect the reliability of scores awarded on the basis of ATJ forms. It seemed possible that the lectures which were to be given in connection with objective grading indoctrination, combined with the actual use of the form in the air, might produce a favorable increase in the accuracy of the subjective grades. It was primarily for this reason that a preliminary group was given two successive checks graded by ATJ forms only.

The trend in results at Stage A shows an increase in reliability of ATJ scores when objective grading occurred. However, if this trend in the Stage A results were a general phenomenon, one would expect it to appear in the data from Stage D also. Since it does not, serious doubt is cast upon the interpretation that ATJ scores are made more reliable by association with objective grading.

Certain differences in procedure between the Stage A tryout and the tryout at Stage D probably account for the inconsistency in results. The major difference in procedure was that the second check pilot in Stage A carried a sealed envelope which contained the results of the first check ride. Whether the check pilot opened the envelope only according to instructions was largely determined by his willingness to cooperate in the experiment. Since considerable instructor resistance was encountered in using the objective grading forms, cooperation with the sealed envelope was probably poorer in the last half of the experiment. This could account for an apparent increase in reliability of ATJ scores used concurrently with objective grading in Stage A without there being any causal connection between objective grading and the rise in reliability.

<u>Objective Scores May Be More Valid, Though No More Reliable Than ATJ</u>

The objective measures, though no more reliable than the subjective, could nevertheless be more valid indications of flying skill. Subjective ratings of performance are known to be influenced by "irrelevant" factors, such as the general appearance of the person rated, his personality, his politeness to the person doing the rating, etc. These characteristics of an individual are fairly constant from day to day and could give rise to a kind of consistency in subjective grading which is quite unrelated to flying skill.

It seems probable that the objective measures are less subject to the above kinds of bias. They should therefore be more relevant measures of flying proficiency. A test of this important possibility is beyond the scope of the present report, since it would require a long-range follow-up of students graded by the two methods.

Objective Grading May Have Influenced Student Performance Favorably

The fact that students in both stages made higher ATJ scores in the second half of the experiment where objective grading was used (cf. Table 4. 1) suggests that they may perform better when they know that a detailed record is being made of the performance. The mean ATJ scores of students who were objectively graded are, in all cases, significantly higher than those of students who were graded by ATJ forms alone.

Major Conclusion

The objective grading methods tried out in this study are not suitable for regular use in Naval Air Training. Although some minor advantages accompany their use, these are offset by major disadvantages resulting from the complexity of the grading forms.

Sixty-nine per cent of the instructors who participated in the experimental tryout considered the use of the objective booklets dangerous. Of these, however, 72 per cent felt that the booklets could be shortened and simplified enough to make them safe, while still retaining the general idea of objective, in-flight grading. Thus, a sizeable majority of the experienced flight instructors who used the objective grading booklets believed that objective, in-flight grading could be made practical; they were, however, in substantial agreement that the particular forms used were not.

In view of the many important advantages of objective grades, continued efforts should be made to develop practical methods of obtaining them.

The present results suggest that predictions of student performance must be based on a wider sample of behavior than that afforded by a single check flight. This agrees with the wartime research of the Army Air Forces (7). The major implication is that more than one check flight must be given to provide reasonably accurate prediction. In the case of the safe-for-solo check at the end of Stage A, where the important prediction is made that the student will or will not be safe-for-solo on his next flight, two independent check rides are recommended.

REFERENCES

1. Bennett, G. K., and others. Flight Jacket Analysis. New York: The Psychological Corporation, Bureau of Medicine and Surgery, Division of Aviation Medicine report, 1949.

2. Ericksen, S. C. Development of an Objective Proficiency Check for Private Pilot Certification. Civil Aeronautics Administration Program Planning Staff Report Report No. 95, Washington, D. C., May, 1951.

3. Cordon, T. The Airline Pilot: A Survey of the Critical Requirements of his Job and of Pilot Evaluation and Selection Procedures. Washington: CAA Division of Research, Report No. 73, 1947.

4. Gordon, T. The Development of a Standard Flight-Check for the Airline Transport Rating Based on the Critical Requirements of the Airline Pilots' Job. Civil Aeronautics Administration Division of Research, Report No. 85, Washington, D. C., 1949.

5. Guilford, J. P. Fundamental Statistics in Psychology and Education. Second Edition. New York: McGraw-Hill, 1950.

6. Mahler, W. R., and Bennett, G. K. Psychological Studies of Advanced Naval Air Training: Analysis of Flight Performance Ratings. Technical Report, Special Devices Center 999-1-2, September, 1950.

7. Miller, N. E. (Ed.) Psychological Research on Pilot Training. Army Air Forces Aviation Psychology Research Report No. 8. Washington: U. S. Government Printing Office, 1947.

8. Nagay, John A. The Airline Tryout of the Standard Flight-Check for the Airline Transport Rating. Washington, CAA Division of Research, Report No. 88, December 1949.

9. Nagay, John A. Revisions of the Standard Flight-Check for the Airline Transport Rating Based on the Airline Tryout. Washington: CAA Division of Research, Report No. 89, May, 1950.

10. National Research Council Committee on Selection and Training of Aircraft Pilots. Standard Check Flight Procedures. Washington, D. C.: CAA Division of Research, Bulletin No. 1, 1942.

11. National Research Council Committee on Selection and Training of Aircraft Pilots. History and Development of the Ohio State Flight Inventory. Part II: Recent Versions and Current Applications. Washington: CAA Division of Research, Report No. 51, 1945.

12. Viteles, M. S. The Aircraft Pilot - Five Years of Research. National Research Council, Division of Anthropology and Psychology, Washington, D. C., 1945.

APPENDIX A

STAGE "A" - PRIMARY

SYLLABUS PERIOD	DESCRIPTION	HOURS FLIGHT	HOURS BRIEFING
	Stage "A" - This stage is devoted to dual instruction for the purpose of qualifying students to fly solo. It consists of seventeen (17) dual instruction flights (A-12 being a dual progress check by a check pilot); one check by student's own instructor (A-18), one check by a member of the Unit's check board (A-19), and one solo (A-20). The student shall be in the front cockpit on all A Stage flights, except as noted in A-6.		
A-1 Dual	Instructor review cockpit fundamentals, including proper use of radio. Student recite check-off list on this and all subsequent flights. Instructor demonstrate taxiing. Instructor introduce fundamentals of attitude flight. Demonstrate inherent stability of aircraft. The proper use of trim tabs will be stressed in all attitude changes. Instructor explain course rules, point out outlying fields in relation to each other, prominent landmarks and area boundaries. Emphasize importance of being alert for other traffic in area.	1.25	.50
A-2 Dual	Review period A-1. Student taxi with help of instructor, review fundamentals of attitude flight, use of trim tabs, and course rules. Instructor demonstrate climbs, glides, and level flight.	1.25	.50
A-3 Dual	Student taxi with help of instructor. Student practice climb to altitude, "S" turns, climbing, gliding, and level flight. Instructor explain and have student practice use of wheels and flaps. Student practice gliding turns with power off, wheels down and flaps 20 degrees. Stress use of trim tabs in all changes in attitudes, airspeeds, and power settings. Instructor introduce approach to a stall.	1.25	.50

SYLLABUS PERIOD	DESCRIPTION	HOURS FLIGHT	HOURS BRIEFING
A-4 Dual	Review basic fundamentals on this and each subsequent flight as necessary. Introduce take-off with help of instructor. Introduce steep turns. Review approach to a stall. Introduce power-off stall with power-off recovery. Student return to home field with help of instructor.	1.25	.50
A-5 Dual	Student taxi out and take off with help of instructor. Review approach to a stall. Introduce straight climbing stall and climbing turn stalls, left and right. Demonstrate field entry and landing. Approaches will be 90 degree power-off, using 20 degrees flap, touch-and-go. Student return to home field with help of instructor.	1.25	.50
A-6 Dual	Student take off and proceed to area. Introduce slow flight, wheels and full flaps down (70 knots). Review approach to a stall. Introduce power-on and power-off spirals. Student practice field entry and 90 degree power-off approaches to touch-and-go landings. Introduce approach turn stalls and landing attitude stalls. Land plane at outlying field and return with student in rear cockpit.	1.25	.50
A-7 Dual	Student take off and proceed to area. Introduce spin, stressing positive recovery. Introduce progressive stall and elevator trim tab stall. Instructor introduce drift correction using rectangular pattern around a field. Introduce 180 degree power approach to touch-and-go landing, using 20 degrees a flap. This and all subsequent approaches will be 180 degree power approaches. Students return to home field and complete approaches as far as his progress and ability permit on this and each subsequent flight.	1.25	.50
A-8 Dual	Student take off, climb to altitude and review high work. Introduce high altitude emergency; a high altitude emergency will be given on all subsequent flights. Student practice 180 degree half flap approaches to touch-and-go landings at a hard surface field.	1.25	.50

SYLLABUS PERIOD	DESCRIPTION	HOURS FLIGHT	HOURS BRIEFING
A-9 Dual	Instructor introduce stalls from skidded, gliding turns. Review spins. Introduce low altitude emergencies. Instructor introduce wave-off procedure at base field. Introduce use of compass and have student refer to it going to and returning from area.	1.25	.50
A-10 Dual	Review 20 degree flap touch-and-go landings. Introduce full flap, full stop landings. Introduce no flap touch-and-go landings. Review high work and introduce steep turn stalls.	1.25	.50
A-11 Dual	Review all maneuvers introduced through A-10	1.25	.50
A-12 Dual Progress Check	Progress check on all maneuvers introduced through A-10, except full flap landings.	1.25	.50
A-13 Dual	Introduce cross-wind landings and take-offs, and review same on all subsequent flights. Review all other work as required.	1.25	.50
A-14 Dual	Review previous work as needed. Instructor demonstrate small field emergency procedure.	1.25	.50
A-15 Dual	Review previous work as needed. Introduce full flaps landing in mild cross-wind.	1.25	.50
A-16 Dual	Review previous work as needed.	1.25	.50
A-17 Dual	Review previous work as needed.	1.25	.50
A-18 Dual	Instructor's check. Cover all work introduced in A Stage. This flight shall be marked "Safe for Solo," or "Unsafe for Solo."	1.25	.50

SYLLABUS PERIOD	DESCRIPTION	HOURS FLIGHT	HOURS BRIEFING
A-19 Check	Check on all Stage A work by a member of the Unit check board. This check is primarily a safety check to determine if the student is safe for solo. The student is required to:	1.50	.50

(1) Inspect the plane, start, warm up and test the engine correctly. At the end of the flight, he should be able to demonstrate the proper method of stopping the engine.
(2) Demonstrate ability to taxi safely and use the brakes properly.
(3) Go over cockpit check-off list correctly. Take off without excessive swerving. Use propeller, throttle and landing gear controls properly.
(4) Fly a series of climbing and gliding "S" turns without excessive skidding or slipping.
(5) Execute two out of three good landings on an outlying field. All landings must be safe and in first third of field. If the student exhibits any tendency to level off high, fly into ground, or fails to hold the stick back after landing, he shall be marked "Unsafe for Solo."
(6) Maintain the prescribed climbing and gliding speeds within reasonable limits.
(7) Enter and recover from all turns and spirals without excessive skidding and slipping.
(8) Demonstrate proper reaction and headwork in emergency procedure.
(9) Fly safely in traffic, obeying all rules.
(10) Demonstrate proper recovery from stalls and spins.
(11) Demonstrate proper procedure for cross-wind landings.

SYLLABUS PERIOD	DESCRIPTION	HOURS FLIGHT	HOURS BRIEFING
A-19 Check	(Cont'd) (12) Satisfactorily master necessary cockpit controls in all take-offs, approaches, and landings. (13) If check is satisfactory, let instructor out and make three (3) solo take-offs and landings at an outlying field. (14) Make a successful power approach to the base field and execute a safe landing on the runway.		
A-20 Solo	Practice maneuvers that are recommended by instructor except students will not practice cross-wind landings, simulated emergencies, small field procedure, normal spins, inverted spins, inverted flight, or acrobatics. The student shall have a fifteen (15) minute warm-up flight with instructor prior to flight A-20, if he has not flown for three days.	1.25	

STAGE "D" - INSTRUMENTS

FLIGHT

SYLLABUS PERIOD	DESCRIPTION	HOURS FLIGHT	HOURS BRIEFING

Stage "D" - This stage consists of sixteen (16) periods devoted to Basic Instruments and Radio Range Procedure and about five (5) periods of contact review flights, the first and last contact flights being safe for solo duals. The first eleven (11) periods will be basic instruments, followed by five (5) periods of radio range work. The eleventh flight is an instrument check and the sixteenth is a radio check. It will be noted that in this syllabus there is no reference made at any time to "Full Panel" or "Partial Panel". Rather each flight is broken into "With Gyros" and the associated maneuvers and "Without Gyros" and the associated maneuvers. This breakdown ensures that the proper amount of time is spent on each item. Scanning is begun with very few instruments and, as the hops progress, additional instruments are added. For clarification, the following definitions and abbreviations are given:

G/H - Gyroscopic Horizon
D/G - Directional Gyro
T/N - Turn Needle
A/D - Air Speed Indicator
Alt. - Altimeter
V/S - Vertical Speed Indicator
I.T.O. - Instrument Take-off
Introduce - To include explanation, demonstration, practice, error correction, and more practice, as needed.
Review - To include practice, error correction, and more practice, as needed.
Demonstrate - No practice or error correction involved.
Practice - Practice

SYLLABUS PERIOD	DESCRIPTION	HOURS FLIGHT	HOURS BRIEFING
	When flying the various maneuvers called for in this syllabus, strive for positive control of attitude and thinking ahead at all times. The take-off Check-off list will be performed by the student on all flight and synthetic device periods. The contact review flights are included once weekly so that the student may maintain contact proficiency during "D" Stage.		
D-1 Dual	<u>With Gyros</u> A. Introduce nose position as shown by G/H. Introduce Alt. as cross-check for level flight. B. Introduce wing position as shown by G/H. Introduce D/G as cross-check for straight flight. C. Practice straight and level flight. D. Instructor have student put nose well above, then well below, horizon and return nose to horizon, cross-checking with altimeter. E. Instructor have student bank wings (R&L) and return wings level, using G/H, cross-checking with D/G. Note: Three (3) instruments only. No climbs or descents.	1.25	.50
D-2 Dual	<u>With Gyros</u> A. Review straight and level flight, using G/H, D/G, and Alt. B. Introduce turns, including thumb rule for rollout. C. Introduce standard rate turns, using G/H, D/G, Alt., and clock. D. Introduce turn needle calibration. E. Introduce Able and Baker pattern. <u>Without Gyros</u> A. Introduce nose position as shown by Alt. B. Introduce wing position as shown by T/N. C. Practice straight and level flight. D. Instructor have student put nose above and below horizon, returning nose to horizon, using Alt.	1.25	.50

SYLLABUS PERIOD	DESCRIPTION	HOURS FLIGHT	HOURS BRIEFING
D-2 Dual (Cont'd)	E. Instructor have student bank wings (R&L) and return wings to level, using T/N. F. Introduce "Thumb Rule for Turn Rollouts."		
D-3 Dual	<u>With Gyros</u> A. Review Baker pattern (1 minute legs). B. Demonstrate lag of V/S. C. Introduce straight climbs and glides (power constant) with A/S as cross-check for nose position as shown by G/H. D. Introduce Ball as directional balance indicator with rudder trim demonstration. E. Introduce Power and Swerve control. F. Trim demonstration. G. Introduce level speed changes. H. Introduce 4 basic transitions. I. Introduce mild unusual attitudes. <u>Without Gyros</u> A. Review straight and level flight. B. Compass, Clock (turning from and to E and W only).	1.25	.50
D-4 Dual	<u>With Gyros</u> A. Review level speed changes. B. Review 4 basic transitions, including standard rate climbs and glides. C. Introduce power - attitude - airspeed. D. Introduce 4 constant speed transitions. E. Introduce DOG Pattern. <u>Without Gyros</u> A. Demonstrate use of magnetic compass. B. Review timed turns to and from any heading. C. Introduce Able Pattern. D. Introduce level speed changes. E. Introduce A/S as nose position indicator. F. Introduce 4 basic transitions. G. Review unusual attitudes.	1.25	.50

SYLLABUS PERIOD	DESCRIPTION	HOURS FLIGHT	HOURS BRIEFING
D-5 Dual	With Gyros A. Review Advanced Baker and DOG Patterns. B. Introduce steep turns. C. Introduce turn pattern. D. Practice constant speed transitions while in a standard rate turn. Without Gyros A. Review timed turns B. Review Able Pattern. C. Review 4 basic transitions. D. Introduce 4 constant speed transitions. E. Introduce DOG Pattern. F. Review unusual attitudes.	1.25	.50
D-6 Dual	With Gyros A. Review turn pattern. B. Review 4 basic transitions. C. Review level speed changes. D. Introduce OBOE Pattern. E. Introduce 2 special transitions (climb to fast cruise, fast cruise to glide). Without Gyros A. Review DOG Pattern. B. Review unusual attitudes. C. Introduce practical problem.	1.25	.50
D-7 Dual	With Gyros A. Demonstrate I.T.O. B. Review TURN Pattern. C. Review OBOE Pattern. D. Introduce CHARLIE Pattern. Without Gyros A. Review unusual attitudes B. Review practical problems.	1.25	.50

SYLLABUS PERIOD	DESCRIPTION	HOURS FLIGHT	HOURS BRIEFING
D-8 Dual	With Gyros A. Demonstrate I.T.O. B. Review TURN Pattern. C. Review CHARLIE Pattern. Without Gyros A. Review unusual attitudes. B. Review practical problem.	1.25	.50
D-9 Dual	With Gyros A. Demonstrate I.T.O. B. Review TURN Pattern C. Review CHARLIE Pattern. Without Gyros A. Review unusual attitudes. B. Review practical problem.	1.25	.50
D-10 Dual	With Gyros A. Demonstrate I.T.O. B. Review TURN Pattern. C. Review CHARLIE Pattern. Without Gyros A. Review unusual attitudes. B. Review practical problems.	1.25	.50
D-11 Check	Check the following With Gyros A. TURN Pattern. B. CHARLIE Pattern. Without Gyros A. Unusual Attitudes. B. Practical problem.	1.25	.50

APPENDIX B

Only maneuvers which have been introduced prior to or on this flight in accordance with the syllabus shall be graded. Attributes will be graded on every flight. Marks shall be awarded comparatively on the basis of the expected progress toward the established standard.

MANEUVER	Unsat.	Below Average	Average	Above Average
Cockpit Check				
Level Flight				
Turns				
Taxiing				
Take-Off				
Slow Flight				
Transitions				
Landing Pattern				
Stalls				
Spirals				
Landing				
Spin				
Emergencies				
Approaches				
X-Wind Landing Procedure				
Headwork				
Reaction Toward Flt.				
Air Discipline				
Mental Attitude				
Total Marks this hop				
Cumulative Flt. Totals				

COMMENTS

(Check one)
Instructional Flight ☐ Check Flight ☐

(Check one)
Up ☐ Down ☐

Student ______________________ Original Class ____________ Flight No. ____________

Date ______________________ Training Unit ____________

Instructor's Signature ____________________

BASIC PRIMARY—STAGE "A", PRIMARY SOLO

CNATRA Form
ATJ-14-2 (Rev. 10 .)
PAT

BINDER MARGIN

DO NOT WRITE ABOVE THIS LINE

Navy-CNATra-P&PO-Pensacola, Fla.

Only maneuvers which have been introduced prior to or on this flight in accordance with the syllabus shall be graded. Attributes will be graded on every flight. Marks shall be awarded comparatively on the basis of the expected progress toward the established standard.

	MANEUVER	Unsat.	Below Average	Average	Above Average
	I.T.O.				
Full Panel	Nose Position				
	Wing Position				
	Transitions				
	Stan'rd Rate Turns				
	Turn Pattern				
Partial Panel	Nose Position				
	Wing Position				
	Transitions				
	Timed Turns				
	Unusual Attitudes				
	Practical Problems				
	Pattern A O				
	Pattern C				
	Pattern B D				
	Headwork				
	Air Discipline				
	Reaction toward Flt.				
	Mental Attitude				
	Total Marks this hop				
	Cumulative Flt. Totals				

COMMENTS

(Check one)

Instructional Flight ☐ Check Flight ☐

(Check one)

Up ☐ Down ☐

Student ________________ Original Class ________ Flight No. ________

Date ________________ Training Unit ________________

Instructor's Signature ________________

BASIC INSTRUMENT—STAGE "D", INSTRUMENTS

APPENDIX C

INTERCORRELATIONS BETWEEN SUBTASKS OF A-19X ATJ USED ALONE

	LANDINGS AND TAKEOFFS	HIGH WORK	PATTERNS AND PROCEDURES	MANEUVER TOTAL	ATTRIBUTES	GRAND TOTAL	MEAN	S.D.	GRAND TOTAL (Corrected for part-whole correlation)
LANDINGS AND TAKEOFFS		.25	.42	.84	.40	.81	12.77	2.55	.45
HIGH WORK			.30	.67	.35	.66	17.37	1.80	.36
PATTERNS AND PROCEDURES				.56	.48	.66	8.44	1.09	.50
MANEUVER TOTAL					.50	.97	38.64	4.11	.49
ATTRIBUTES						.65	8.70	0.94	.52
GRAND TOTAL							49.94	4.93	

N = 109

INTERCORRELATIONS BETWEEN SUBTASKS OF A-19AX ATJ USED ALONE

	LANDINGS AND TAKEOFFS	HIGH WORK	PATTERNS AND PROCEDURES	MANEUVER TOTAL	ATTRIBUTES	GRAND TOTAL	MEAN	S.D.	GRAND TOTAL (Corrected for part-whole correlation)
LANDINGS AND TAKEOFFS		.24	.18	.85	.32	.80	13.48	2.49	.38
HIGH WORK			.16	.64	.32	.62	17.37	1.65	.30
PATTERNS AND PROCEDURES				.35	.42	.49	8.58	0.88	.32
MANEUVER TOTAL					.44	.96	39.39	3.81	.36
ATTRIBUTES						.63	8.84	0.98	.47
GRAND TOTAL							50.91	4.47	

N = 109

INTERCORRELATIONS BETWEEN SUBTASKS OF A-19X ATJ USED WITH OBJECTIVE GRADING

	LANDINGS AND TAKEOFFS	HIGH WORK	PATTERNS AND PROCEDURES	MANEUVER TOTAL	ATTRIBUTES (less air discipline)	GRAND TOTAL	MEAN	S.D.	GRAND TOTAL (Corrected for part-whole correlation)
LANDINGS AND TAKEOFFS		.37	.27	.84	.46	.80	13.13	2.54	.51
HIGH WORK			.23	.72	.35	.68	17.46	2.39	.34
PATTERNS AND PROCEDURES				.48	.48	.59	8.34	1.29	.41
MANEUVER TOTAL					.58	.97	42.07	4.62	.56
ATTRIBUTES (less air discipline)						.72	8.89	1.09	.61
GRAND TOTAL							53.54	5.72	

N = 112

INTERCORRELATIONS BETWEEN SUBTASKS OF A-19AX ATJ USED WITH OBJECTIVE GRADING

	LANDINGS AND TAKEOFFS	HIGH WORK	PATTERNS AND PROCEDURES	MANEUVER TOTAL	ATTRIBUTES (less air discipline)	GRAND TOTAL	MEAN	S.D.	GRAND TOTAL (Corrected for part-whole correlation)
LANDINGS AND TAKEOFFS		.43	.28	.84	.27	.80	13.05	2.39	.45
HIGH WORK			.15	.76	.38	.74	17.29	1.83	.47
PATTERNS AND PROCEDURES				.40	.30	.50	8.61	1.04	.31
MANEUVER TOTAL					.43	.97	42.14	4.11	.44
ATTRIBUTES (less air discipline						.60	9.04	1.00	.44
GRAND TOTAL							53.97	4.81	

N = 112

INTERCORRELATIONS BETWEEN SUBTASKS OF A-19X
OBJECTIVE

	PATTERNS AND PROCEDURES	LEFT HALF LANDINGS	RIGHT HALF LANDINGS	TAKEOFF AND LANDINGS	EMERGENCIES	HIGH WORK	ATTRIBUTES	TOTAL	MEAN	S.D.	TOTAL (Corrected for part-whole correlation)
PATTERNS AND PROCEDURES		.60	.30	.55	.43	.41	.48	.70	30.43	4.90	.61
LEFT HALF LANDINGS			.56	.90	.46	.52	.51	.88	63.70	13.11	.71
RIGHT HALF LANDINGS				.86	.32	.41	.52	.77	53.18	12.70	.51
TAKEOFF AND LANDINGS					.44	.55	.58	.95	124.86	23.57	.58
EMERGENCIES						.45	.46	.57	12.48	2.37	.52
HIGH WORK							.38	.71	31.37	5.98	.60
ATTRIBUTES								.66	3.62	1.93	.62
TOTAL									203.52	32.41	

N = 112

INTERCORRELATIONS BETWEEN SUBTASKS OF A-19AX OBJECTIVE

	PATTERNS AND PROCEDURES	LEFT HALF LANDINGS	RIGHT HALF LANDINGS	TAKEOFF AND LANDING	EMERGENCIES	HIGH WORK	ATTRIBUTES	TOTAL	MEAN	S.D.	TOTAL (Corrected for part-whole correlation)
PATTERNS AND PROCEDURES		.58	.38	.58	.30	.43	.46	.70	30.73	5.39	.61
LEFT HALF LANDINGS			.55	.94	.33	.46	.51	.89	65.70	16.86	.67
RIGHT HALF LANDINGS				.80	.24	.52	.52	.79	53.64	12.05	.59
TAKEOFF AND LANDING					.34	.56	.60	.97	126.98	27.25	.62
EMERGENCIES						.30	.38	.41	12.18	2.35	.35
HIGH WORK							.50	.69	31.88	5.24	.60
ATTRIBUTES								.67	3.79	1.86	.64
TOTAL									206.14	34.99	

N = 112

INTERCORRELATIONS BETWEEN SUBTASKS OF D-11X
ATJ USED ALONE

	FULL PANEL LESS PATTERNS	FULL PANEL PATTERN TOTAL	FULL PANEL TOTAL	PARTIAL PANEL LESS PATTERNS	PARTIAL PANEL PATTERN TOTAL	PARTIAL PANEL TOTAL	FLIGHT ATTI-TUDE TOTAL	PATTERN TOTAL	MANEUVER TOTAL	ATTRIBUTES	GRAND TOTAL	MEAN	S.D.	GRAND TOTAL (Corrected for part-whole correlation)
FULL PANEL LESS PATTERNS		.66	.95	.34	.25	.36	.78	.57	.76	.38	.74	11.67	2.11	.50
FULL PANEL PATTERN TOTAL			.86	.32	.23	.36	.58	.81	.72	.55	.75	5.61	1.28	.63
FULL PANEL TOTAL				.36	.28	.39	.78	.72	.82	.49	.81	17.28	3.11	.45
PARTIAL PANEL LESS PATTERNS					.66	.94	.84	.61	.79	.39	.78	10.86	2.40	.52
PARTIAL PANEL PATTERN TOTAL						.30	.57	.79	.67	.31	.66	5.05	1.25	.52
PARTIAL PANEL TOTAL							.82	.72	.82	.39	.82	16.06	3.32	.43
FLIGHT ATTI-TUDE TOTAL								.72	.95	.47	.93	22.54	3.69	.66
PATTERN TOTAL									.88	.55	.88	10.66	2.02	.75
MANEUVER TOTAL										.53	.99	33.42	5.33	.61
ATTRIBUTES											.66	12.01	1.21	.52
GRAND TOTAL												45.43	6.05	

N = 110

INTERCORRELATIONS BETWEEN SUBTASKS OF D-11AX ATJ USED ALONE

	FULL PANEL LESS PATTERNS	FULL PANEL PATTERN TOTAL	FULL PANEL TOTAL	PARTIAL PANEL LESS PATTERNS	PARTIAL PANEL PATTERN TOTAL	PARTIAL PANEL TOTAL	FLIGHT ATTI-TUDE TOTAL	PATTERN TOTAL	MANEUVER TOTAL	ATTRIBUTES	GRAND TOTAL	MEAN	S.D.	GRAND TOTAL (Corrected for part-whole correlation)
FULL PANEL LESS PATTERNS		.72	.96	.36	.24	.27	.81	.62	.79	.55	.80	12.28	1.94	[illegible]
FULL PANEL PATTERN TOTAL			.89	.24	.18	.18	.57	.76	.68	.51	[illegible]	6.05	1.13	.57
FULL PANEL TOTAL				.34	.23	.25	.77	.72	.81	.57	.82	18.33	2.36	.46
PARTIAL PANEL LESS PATTERNS					.71	.83	.84	.63	.23	.30	.76	11.23	2.11	.50
PARTIAL PANEL PATTERN TOTAL						.76	.59	.78	.67	.35	.66	5.42	1.17	.51
PARTIAL PANEL TOTAL							.68	.62	.70	.26	.66	16.87	3.33	.57
FLIGHT ATTI-TUDE TOTAL								.75	.97	.51	.95	23.51	3.34	.74
PATTERN TOTAL									.88	.56	.89	11.46	1.76	.78
MANEUVER TOTAL										.57	.98	35.07	4.75	.50
ATTRIBUTES											.69	12.61	1.10	.56
GRAND TOTAL												47.64	5.48	

N = 110

INTERCORRELATIONS BETWEEN SUBTASKS OF D-11X ATJ USED WITH OBJECTIVE GRADING

	FULL PANEL LESS PATTERNS	FULL PANEL PATTERN TOTAL	FULL PANEL TOTAL	PARTIAL PANEL LESS PATTERNS	PARTIAL PANEL PATTERN TOTAL	PARTIAL PANEL TOTAL	FLIGHT ATTITUDE TOTAL	PATTERN TOTAL	MANEUVER TOTAL	ATTRIBUTES	GRAND TOTAL	MEAN	S.D.	GRAND TOTAL (Corrected for part-whole correlation)
FULL PANEL LESS PATTERNS		.67	.95	.36	.32	.37	.83	.60	.76	.34	.78	12.26	1.32	.58
FULL PANEL PATTERN TOTAL			.86	.27	.27	.30	.57	.75	.66	.32	.69	6.24	1.15	.56
FULL PANEL TOTAL				.35	.33	.37	.80	.71	.78	.36	.31	18.50	2.21	.48
PARTIAL PANEL LESS PATTERNS					.66	.94	.82	.61	.75	.21	.75	11.73	1.90	.53
PARTIAL PANEL PATTERN TOTAL						.88	.60	.84	.67	.31	.59	5.54	1.40	.52
PARTIAL PANEL TOTAL							.79	.77	.78	.27	.79	17.27	3.02	.39
FLIGHT ATTITUDE TOTAL								.73	.92	.33	.73	23.99	3.14	.72
PATTERN TOTAL									.83	.39	.36	11.78	2.04	.70
MANEUVER TOTAL										.15	.78	35.62	5.28	.27
ATTRIBUTES											.33	12.40	1.31	.11
GRAND TOTAL												48.00	5.70	

N = 108

INTERCORRELATIONS BETWEEN SUBTASKS OF D-11AX ATJ USED WITH OBJECTIVE GRADING

	FULL PANEL LESS PATTERNS	FULL PANEL PATTERN TOTAL	FULL PANEL TOTAL	PARTIAL PANEL LESS PATTERNS	PARTIAL PANEL PATTERN TOTAL	PARTIAL PANEL TOTAL	FLIGHT ATTITUDE TOTAL	PATTERN TOTAL	MANEUVER TOTAL	ATTRIBUTES	GRAND TOTAL	MEAN	S.D.	GRAND TOTAL (Corrected for part-whole correlation)
FULL PANEL LESS PATTERNS		.50	.91	.29	.32	.34	.75	.52	.73	.41	.74	12.95	1.50	.52
FULL PANEL PATTERN TOTAL			.80	.09	.13	.12	.34	.66	.50	.43	.54	6.36	.94	.37
FULL PANEL TOTAL				.24	.28	.29	.67	.66	.73	.47	.75	19.33	2.16	.39
PARTIAL PANEL LESS PATTERNS					.65	.94	.85	.54	.78	.22	.74	11.93	1.85	.45
PARTIAL PANEL PATTERN TOTAL						.87	.63	.83	.76	.23	.73	5.69	1.27	.55
PARTIAL PANEL TOTAL							.83	.72	.85	.24	.81	17.60	2.81	.32
FLIGHT ATTITUDE TOTAL								.65	.94	.38	.92	24.88	2.70	.64
PATTERN TOTAL									.85	.41	.85	12.06	1.69	.67
MANEUVER TOTAL										.41	.98	36.95	4.06	.44
ATTRIBUTES											.59	12.62	1.04	.41
GRAND TOTAL												49.57	4.59	

N = 108

INTERCORRELATIONS BETWEEN SUBTASKS OF D-11X OBJECTIVE

	TURN PATTERN	"C" PATTERN	UNUSUAL ATTITUDES	PRACTICAL PROBLEM	TOTAL	MEAN	S.D.	TOTAL (Corrected for part-whole correlation)
TURN PATTERN		.53	.21	.24	.66	31.49	4.12	.52
"C" PATTERN			.27	.46	.91	76.12	12.99	.54
UNUSUAL ATTITUDES				.53	.54	10.94	4.44	.36
PRACTICAL PROBLEM					.67	15.51	4.78	.50
TOTAL						134.85	20.21	

N = 108

INTERCORRELATIONS BETWEEN SUBTASKS OF D-11AX OBJECTIVE

	TURN PATTERN	"C" PATTERN	UNUSUAL ATTITUDES	PRACTICAL PROBLEM	TOTAL	MEAN	S.D.	TOTAL (Corrected for part-whole correlation)
TURN PATTERN		.40	.26	.25	.56	31.36	3.89	.40
"C" PATTERN			.47	.56	.92	76.38	11.89	.63
UNUSUAL ATTITUDES				.45	.66	11.59	4.39	.50
PRACTICAL PROBLEMS					.74	15.25	5.22	.58
TOTAL						135.06	19.80	

N = 108

APPENDIX D

ITEM CRITERION CORRELATIONS

STAGE A

Reference can be made to the Stage A objective grading form to discover the particular items referred to by number below. The numbers have been assigned in sequence throughout the form.

Page	Item	r_{bis}	p
	001	*	*
	002	.04	.92
	003	*	*
1	004	.03	.88
	005	.32	.80
	006	.11	.82
	007	*	*
	008	*	*
	009	.17	.82
	010	.37	.77
	011	.34	.66
	012	.27	.77
	013	.37	.80
2	014	.07	.84
	015	.42	.65
	016	.17	.47
	017	.02	.34
	018	.12	.94
	019	.25	.72
	020	.25	.70
	021	.30	.64
	022	.26	.62
3	023	.36	.62
	024	.02	.94
	025	.34	.57
	026	*	*
	027	.02	.81
	028	.51	.55
3	029	.01	.83
(Cont'd)	030	.47	.81
	031	.36	.30
	032	-.01	.77
	033	-.01	.55
	034	.19	.77
	035	*	*
	036	.11	.54
	037	.14	.65
	038	.27	.56
	039	.31	.75
	040	.07	.62
	041	.49	.75
	042	.30	.54
	043	.06	.59
4	044	.17	.57
	045	.05	.59
	046	.24	.73
	047	.13	.49
	048	.11	.71
	049	*	*
	050	.38	.86
	051	.32	.69
	052	.30	.69
	053	.24	.76
	054	.04	.61
	055	.25	.49

* Item not analyzed since p exceeded .95

Page	Item	r_{bis}	p
	100	.20	.81
	101	-.17	.94
	102	*	*
7	103	.13	.92
	104	.00	.81
	105	.23	.31
	106	.24	.61
	107	-.07	.61
	108	*	*
8	109	.22	.80
	110	.33	.60
	111	.14	.61
	112	-.02	.95
	113	.21	.93
	114	.02	.25
9	115	.26	.62
	116	.33	.77
	117	*	*
	118	.14	.90
	119	.37	.61
	120	.10	.87
	121	.36	.76
	122	.21	.70
	123	.45	.61
	124	.20	.90
10	125	.28	.67
	126	.51	.82
	127	.20	.71
	128	.32	.80
	129	.20	.53
	130	.22	.80
	131	.18	.78
	132	.28	.55
	133	.32	.75
	139	.30	.67
	140	.35	.88
11	141	.21	.90
	142	*	*
	143	.30	.69

Page	Item	r_{bis}	p
	144	.09	.94
	145	-.11	.73
11	146	.16	.78
(Cont'd)	147	.11	.88
	148	.23	.88
	149	-.08	.66
	150	.11	.98
	151	-.09	.81
	152	*	*
12	153	.20	.34
	154	.17	.74
	155	.13	.87
	156	.24	.77
	157	.48	.49
	158	.34	.68
	159	.14	.50
	160	.04	.54
	161	.26	.58
	162	.20	.93
	163	.28	.64
	164	*	*
	165	.32	.81
13	166	-.04	.48
	167	.28	.76
	168	.28	.81
	169	.20	.33
	170	-.12	.71
	171	.31	.64
	172	.04	.76
	173	-.07	.91
	174	.16	.62
	175	.27	.60
	176	.39	.69
14	177	.26	.62
	178	.23	.51
	179	.39	.64
	180	.45	.69
	181	.24	.53
	182	.17	.49
	183	.02	.88

Page	Item	r_{bis}	p
	184	.18	.86
	185	.35	.60
	186	.28	.74
14	187	*	*
(Cont'd)	188	.21	.90
	189	.30	.81
	190	.15	.88
	191	.32	.71
	192	.06	.48
	193	.12	.43
	260	.18	.72
	261	*	*
	262	.32	.49
15	263	.02	.49
	264	.20	.36
	265	*	*
	266	-.14	.92
	267	.48	.62
	268	.17	.91
	269	-.15	.86
	270	.21	.52
	271	.31	.68
	272	.07	.84
	273	.12	.59
	274	.06	.68
19	275	.36	.76
	276	-.03	.86
	277	.35	.55
	278	.21	.86
	279	*	*
	280	.18	.88
	281	.29	.76
	282	.38	.81
	283	.49	.15
	284	.16	.49
20	285	.33	.24
	286	.22	.41
	287	.37	.44
	288	.46	.51

OBJECTIVE-TYPE GRADING

A-19 CHECK FLIGHT

EXPERIMENTAL FORM

Prepared by

THE PSYCHOLOGICAL CORPORATION

and

U. S. NAVAL SCHOOL OF AVIATION MEDICINE

STUDENT ORIGINAL CLASS

FLIGHT No DATE UNIT

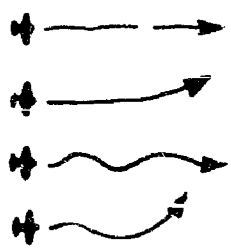
INSTRUCTOR'S SIGNATURE

Contract No. Nonr 442 00 01

PRE-FLIGHT AND TAXIING

				COMMENTS
PLANE INSPECTION	Proper	Improper ☐		
STARTING PROCEDURE	Proper	Improper ☐		
PRE-FLIGHT CHECK-OFF LIST	Checked all items	Missed one or more ☐		
TAXIING SPEED	Proper	Uneven	Too Fast ☐	
DIRECTIONAL CONTROL	S turns properly	Overcontrolled S turns	Too small S turns	
BRAKE POWER COORDINATION	Well coordinated	Rides Brakes	Abrupt Brakes ☐	
OBEYS COURSE RULES OR SIGNALMAN	Yes	No ☐		
TAKE OFF CHECK OFF LIST	Proper	Improper ☐		

INITIAL TAKEOFF AND FIELD DEPARTURE

		COMMENTS
POWER APPLICATION	Prompt / Too Fast ☐ / Too Slow ☐	
DIRECTIONAL CONTROL ON TAKEOFF ROLL	 Minor Deviations Well Controlled / Angled Yet Fairly Straight Path / Too Much Swerve Yet Down the Center / ☐ Unsafe	
ATTITUDE ON TAKEOFF ROLL	NOSE: Proper / High ☐ / Low ☐	
	WING: Proper / One Low ☐	
NOSE ATTITUDE JUST AFTER AIRBORNE	Proper / High ☐ / Low ☐	
POWER REDUCTION AND WHEELS UP	Proper / Improper ☐	
AIR DISCIPLINE LEAVING HOME FIELD	Follows Course Rules and Correct Procedures / Deviates Slightly from Rules and Regulations / ☐ Deviates Dangerously	
CLIMBING AIRSPEED	85 · 90 · 95 · 100 · 105	
TRANSITION FROM CLIMB TO S L FLIGHT		
ALTITUDE	150 · 100 · 50 · Proper · + 50 · + 100 · + 150	
THROTTLE	Proper / Improper	
TAB USE	Proper / Improper	
STRAIGHT & LEVEL FLIGHT	Well Controlled / Uneven or Erratic ☐	

STANDARD FIELD ENTRY

		COMMENTS
ALTITUDE in circle	800 · 900 · 1000 · 1100 · 1200	
AIRSPEED in circle	110 · 115 · 120 · 125 · 130	
TRACK in circle	Maintains Proper Wingtip Distance in Circle / Improper Track in Circle	
No 1 POSITION DOWN TO 500 CIRCLE		
SELECTS BEST TANK	Yes · No	
DISTANCE AT No 2 POSITION	Proper · Wide or Close	
POWER RETARD & WHEELS DOWN	Proper · Improper	
CONTROL DURING TRANSITION — Track	Proper Distance · Gets Close · Gets Wide	
ALTITUDE UNTIL REACHING GLIDING AIRSPEED	800 · 900 · 1000 · 1100 · 1200	
LOWERS ½ FLAP	Forgets · 500 · 600 · 700 · 800 · 900	
VOICE REPORT LANDING X-O LIST	Proper · Early or Late · Forgets One or More Items	
AIRSPEED IN LETDOWN	85 · 90 · 95 · 100 · 105	
TRANSITION AT 500		
ALTITUDE	400 · 450 · 500 · 550 · 600	
AIRSPEED	80 · 85 · 90 · 95 · 100	

500' PATTERN TOUCH & GO LANDINGS

TRAFFIC INTERVAL	Proper	Short		Long	
VOICE REPORT WHEELS DOWN	Yes	No			
DOWNWIND LEG AIRSPEED	80	85	90	95	100
ALTITUDE	400	450	500	550	600
TRACK DOWNWIND	Proper Small Corrections	Proper Large Corrections		Wide or Close	
BEGINS APPROACH TURN	Abeam	Early		Late	
APPROACH AIRSPEED	◄ SLOW 15	10	5	Proper	FAST ► +5 +10 +15
CONTROL OF DESCENT	Proper			Erratic	
APPROACH TRACK	Proper	Improper			
ALTITUDE IN STRAIGHT-AWAY	Proper	High		Low	
BEGINS TRANSITION TO LANDING	Approx 30 Ft	High		Low	

MANNER OF TOUCHDOWN

TRACK	Straight	Drifting	Over-correcting
ALIGNMENT	Straight		Crabbed
ATTITUDE	3 Pt	Hard 3 Pt	Wheels
BOUNCE	No		Yes
CORRECTION FOR BOUNCE	Proper		Improper
TOUCH DOWN POINT ON RUNWAY	First 1/3		Other
STICK ON ROLLOUT	FULL BACK INTO WIND IF NEEDED Yes		No
DIRECTIONAL CONTROL (ROLLOUT & TAKEOFF)	Small Deviations		Swerve
NOSE ATTITUDE LEAVING DECK	Proper	High	Low
AIRSPEED IN CLIMB	SLOW ◄ 15 -10 -5	Proper	► FAST +5 +10 +15
USE OF TRIM FOR ENTIRE PATTERN	Good	Fair	Poor

500' PATTERN TOUCH & GO LANDINGS

TRAFFIC INTERVAL	Proper	Short ☐	Long ☐
VOICE REPORT (WHEELS DOWN)	Yes	No	
DOWNWIND LEG AIRSPEED	80 85 90 95 100		
ALTITUDE	400 450 500 550 600		
TRACK DOWNWIND	Proper Small Corrections	Proper Large Corrections	Wide or Close ☐
BEGINS APPROACH TURN	Abeam	Early	Late
APPROACH AIRSPEED	◄ SLOW / FAST ► 15 10 5 Proper +5 +10 +15		
CONTROL OF DESCENT	Proper		Erratic ☐
APPROACH TRACK	Proper	Improper ☐	
ALTITUDE IN STRAIGHT-AWAY	Proper	High ☐	Low ☐
BEGINS TRANSITION TO LANDING	Approx 30 Ft	High ☐	Low ☐

MANNER OF TOUCHDOWN

TRACK	Straight	Drifting ☐	Over correcting ☐
ALIGNMENT	Straight		Crabbed ☐
ATTITUDE	3 Pt	Hard 3 Pt ☐	Wheels ☐
BOUNCE	No		Yes ☐
CORRECTION FOR BOUNCE	Proper		Improper ☐
TOUCH DOWN POINT ON RUNWAY	First 1/3		Other ☐
STICK ON ROLLOUT	FULL BACK INTO WIND IF NEEDED Yes		No ☐
DIRECTIONAL CONTROL (ROLLOUT & TAKEOFF)	Small Deviations		Swerve ☐
NOSE ATTITUDE LEAVING DECK	Proper	High ☐	Low ☐
AIRSPEED IN CLIMB	SLOW ◄ / ► FAST 15 10 5 Proper +5 +10 +15		
USE OF TRIM FOR ENTIRE PATTERN	Good	Fair	Poor ☐

500' PATTERN TOUCH & GO LANDINGS

TRAFFIC INTERVAL	Proper	Short	Long
VOICE REPORT WHEELS DOWN.	Yes	No	
DOWNWIND LEG AIRSPEED	80 85 90 95 100		
ALTITUDE	400 450 500 550 600		
TRACK DOWNWIND	Proper Small Corrections	Proper Large Corrections	Wide or Close
BEGINS APPROACH TURN	Abeam	Early	Late
APPROACH AIRSPEED	◄ SLOW FAST ► 15 10 5 Proper 5 10 15		
CONTROL OF DESCENT	Proper		Erratic
APPROACH TRACK	Proper	Improper	
ALTITUDE IN STRAIGHT-AWAY	Proper	High	Low
BEGINS TRANSITION TO LANDING	Approx 30 Ft	High	Low

MANNER OF TOUCHDOWN

TRACK	Straight	Drifting	Over correcting
ALIGNMENT	Straight		Crabbed
ATTITUDE	3 Pt	Hard 3 Pt	Wheels
BOUNCE	No		Yes
CORRECTION FOR BOUNCE	Proper		Improper
TOUCH DOWN POINT ON RUNWAY	First 1/3		Other
STICK ON ROLLOUT	FULL BACK INTO WIND IF NEEDED Yes		No
DIRECTIONAL CONTROL (ROLLOUT & TAKEOFF)	Small Deviations		Swerve
NOSE ATTITUDE LEAVING DECK	Proper	High	Low
AIRSPEED IN CLIMB	SLOW ◄ ► FAST 15 10 5 Proper +5 +10 +15		
USE OF TRIM FOR ENTIRE PATTERN	Good	Fair	Poor

LOW ALTITUDE EMERGENCIES

	1st	2nd	COMMENTS
AIRSPEED CONTROL			
Safe			
Unsafe	☐	☐	
USE OF LANDING GEAR			
Proper			
Improper	☐	☐	
PROP TO LOW PITCH			
Yes			
No			
FULL FLAPS WHEN NEEDED			
Yes			
No			
SEQUENCE OF ABOVE ITEMS			
Proper			
Improper			
PLANNING			
Good			
Fair			
Poor	☐	☐	

STEEP TURNS

	Right	Left	Right	Left	COMMENTS
ANGLE OF BANK					
45° ± 5°					
45° ± 10°					
Varies Excessively	☐	☐	☐	☐	
ALTITUDE CONTROL					
within ± 100					
± 100 to ± 200					
outside ± 200	☐	☐	☐	☐	
USE OF POWER					
proper					
improper					
ROLLOUT ON HEADING					
± 10°					
± 30°					
over ± 20°	☐	☐	☐	☐	

SLOW FLIGHT

	1st	2nd	COMMENTS
ALTITUDE CONTROL			
within ± 50			
± 50' to ± 100			
over ± 100	☐	☐	
DIRECTIONAL CONTROL			
within ± 5°			
± 5° to ± 10°			
over ± 10°	☐	☐	
USE OF POWER			
proper			
improper			
WHEELS AND FLAPS			
proper			
improper			

STALLS

ACROBATIC CHECK OFF LIST	Proper / Improper	TYPE OF STALL: CLIMBING TURN LEFT	POWER OFF	APPROACH TURN	OPTIONAL	COMMENTS
ENTRY	Proper					
	Improper					
RECOGNITION	Proper					
	Early					
	Late					
RECOVERY Decrease in Angle of Attack	Prompt and positive					
	Hesitant or slow					
ALTITUDE CONTROL	Minimum loss					
	Too much loss					
	Re stalls					
DIRECTIONAL CONTROL	Good					
	Fair					
	Poor					

SPINS

	1st TRIAL			2nd TRIAL		
ENTRY						
ENTRY	Proper		Improper	Proper		Improper
ROTATION	RUDDER			RUDDER		
USE OF CONTROLS DURING ROTATION	Full Throw		Not Full	Full Throw		Not Full
	STICK			STICK		
	Full Back	Not Full	Uses Aileron	Full Back	Not Full	Uses Aileron
RECOVERY	RUDDER			RUDDER		
USE OF CONTROLS FOR RECOVERY	Full Throw		Not Full	Full Throw		Not Full
	STICK			STICK		
	Positive	Hesitant	Uses Aileron	Positive	Hesitant	Uses Aileron
TIMING OF STICK AND RUDDER USE	Proper Order	Simultaneous	Reversed Order	Proper Order	Simultaneous	Reversed Order
NEUTRALIZATION OF CONTROLS	Proper	Early	Late	Proper	Early	Late
RETURN TO LEVEL FLIGHT	Smooth	Abrupt	Slow	Smooth	Abrupt	Slow
POWER APPLICATION	Proper		Improper	Proper		Improper
SEQUENCE OF PROP & THROTTLE	Proper		Improper	Proper		Improper

HIGH ALTITUDE EMERGENCIES

		COMMENTS
TRANSITION TO GLIDE	Proper / Improper	
CHANGES GAS SELECTOR	Yes / No	
LANDING AREA SELECTED	PICKS FIELD: Good / Fair / Poor / No apparent selection	
PROP TO LOW PITCH	Yes / No	
GLIDING A S	85 / 90 / 95 / 100 / 105	
USES CHECK POINTS IF APPLICABLE	Yes / No	
CLEARS ENGINE EVERY 1000 FT	Yes / No	
WHEELS DOWN AT 1200 FT. (IF LANDING AT AUTHORIZED FIELD)	Yes / No	
POSITION AT 1000 FT. ALTITUDE	Good / Fair / Poor	
VOICE REPORT IF NECESSARY LANDING CHECK-OFF LIST AND WHEELS DOWN	Proper / Improper	

STANDARD FIELD ENTRY

						COMMENTS
ALTITUDE (in circle)	800'	900'	1000'	1100'	1200'	
AIRSPEED (in circle)	110	115	120	125	130	
TRACK (in circle)	Maintains Proper Wingtip Distance in Circle Improper Track in Circle					
No. 1 POSITION DOWN TO 500' CIRCLE						
SELECTS BEST TANK	Yes	No				
DISTANCE AT No. 2 POSITION	Proper	Wide or Close ☐				
POWER RETARD & WHEELS DOWN	Proper	Improper				
CONTROL DURING TRANSITION Track	Proper Distance	Gets Close	Gets Wide			
ALTITUDE UNTIL REACHING GLIDING AIRSPEED	800	900	1000	1100	1200	
LOWERS 1/3 FLAP	Forgets ☐	500	600	700	800	900
VOICE REPORT LANDING X-O LIST	Proper	Early or Late	Forgets One or More Items ☐			
AIRSPEED IN LETDOWN	85	90	95	100	105	
TRANSITION AT 500'						
ALTITUDE	400	450	500	550	600	
AIRSPEED	80	85	90	95	100	

500' PATTERN TOUCH & GO LANDINGS

TRAFFIC INTERVAL	Proper	Short ☐	Long ☐
VOICE REPORT (WHEELS DOWN)	Yes	No	
DOWNWIND LEG AIRSPEED	80 85 90 95 100		
ALTITUDE	400 450 500 550 600		
TRACK DOWNWIND	Proper Small Corrections	Proper Large Corrections	Wide or Close ☐
BEGINS APPROACH TURN	Abeam	Early	Late
APPROACH AIRSPEED	◄ SLOW … FAST ► 15 10 5 Proper +5 +10 +15		
CONTROL OF DESCENT	Proper		Erratic ☐
APPROACH TRACK	Proper	Improper ☐	
ALTITUDE IN STRAIGHT-AWAY	Proper	High ☐	Low ☐
BEGINS TRANSITION TO LANDING	Approx 30 Ft	High ☐	Low ☐

MANNER OF TOUCHDOWN

TRACK	Straight	Drifting ☐	Over-correcting ☐
ALIGNMENT	Straight		Crabbed ☐
ATTITUDE	3 Pt	Hard 3 Pt ☐	Wheels ☐
BOUNCE	No		Yes ☐
CORRECTION FOR BOUNCE	Proper		Improper ☐
TOUCH DOWN POINT ON RUNWAY	First 1/3		Other ☐
STICK ON ROLLOUT	FULL BACK (INTO WIND IF NEEDED) Yes		No ☐
DIRECTIONAL CONTROL (ROLLOUT & TAKEOFF)	Small Deviations		Swerve ☐
NOSE ATTITUDE LEAVING DECK	Proper	High ☐	Low ☐
AIRSPEED IN CLIMB	SLOW ◄ … ► FAST 15 10 5 Proper +5 +10 +15		
USE OF TRIM FOR ENTIRE PATTERN	Good	Fair	Poor ☐

500' PATTERN TOUCH & GO LANDINGS

TRAFFIC INTERVAL	Proper	Short	Long
VOICE REPORT WHEELS DOWN	Yes	No	
DOWNWIND LEG AIRSPEED	80 85 90 95 100		
ALTITUDE	400 450 500 550 600		
TRACK DOWNWIND	Proper Small Corrections	Proper Large Corrections	Wide or Close
BEGINS APPROACH TURN	Abeam	Early	Late
APPROACH AIRSPEED	◄ SLOW 15 10 5 Proper 5 10 15 FAST ►		
CONTROL OF DESCENT	Proper		Erratic
APPROACH TRACK	Proper	Improper	
ALTITUDE IN STRAIGHT-AWAY	Proper	High	Low
BEGINS TRANSITION TO LANDING	Approx 30 Ft	High	Low

MANNER OF TOUCHDOWN

TRACK	Straight	Drifting	Over correcting
ALIGNMENT	Straight		Crabbed
ATTITUDE	3 Pt	Hard 3 Pt	Wheels
BOUNCE	No		Yes
CORRECTION FOR BOUNCE	Proper		Improper
TOUCH DOWN POINT ON RUNWAY	First 1/3		Other
STICK ON ROLLOUT	FULL BACK INTO WIND IF NEEDED Yes		No
DIRECTIONAL CONTROL (ROLLOUT & TAKEOFF)	Small Deviations		Swerve
NOSE ATTITUDE LEAVING DECK	Proper	High	Low
AIRSPEED IN CLIMB	SLOW ◄ 15 10 5 Proper +5 +10 +15 ► FAST		
USE OF TRIM FOR ENTIRE PATTERN	Good	Fair	Poor

500' PATTERN TOUCH & GO LANDINGS

TRAFFIC INTERVAL	Proper	Short ☐	Long ☐
VOICE REPORT (WHEELS DOWN)	Yes	No	
DOWNWIND LEG AIRSPEED	80 85 90 95 100		
ALTITUDE	400 450 500 550 600		
TRACK DOWNWIND	Proper Small Corrections	Proper Large Corrections	Wide or Close ☐
BEGINS APPROACH TURN	Abeam	Early	Late
APPROACH AIRSPEED	◄ SLOW FAST ► -15 -10 -5 Proper +5 +10 +15		
CONTROL OF DESCENT	Proper		Erratic ☐
APPROACH TRACK	Proper	Improper ☐	
ALTITUDE IN STRAIGHT-AWAY	Proper	High ☐	Low ☐
BEGINS TRANSITION TO LANDING	Approx. 30 Ft	High ☐	Low ☐

MANNER OF TOUCHDOWN

TRACK	Straight	Drifting ☐	Over-correcting ☐
ALIGNMENT	Straight		Crabbed ☐
ATTITUDE	3 Pt	Hard 3 Pt ☐	Wheels ☐
BOUNCE	No		Yes ☐
CORRECTION FOR BOUNCE	Proper		Improper ☐
TOUCHDOWN POINT ON RUNWAY	First 1/3		Other ☐
STICK ON ROLLOUT	FULL BACK INTO WIND IF NEEDED Yes		No ☐
DIRECTIONAL CONTROL (ROLLOUT & TAKEOFF)	Small Deviations		Swerve ☐
NOSE ATTITUDE LEAVING DECK	Proper	High ☐	Low ☐
AIRSPEED IN CLIMB	SLOW ◄ ► FAST -15 -10 -5 Proper +5 +10 +15		
USE OF TRIM FOR ENTIRE PATTERN	Good	Fair	Poor ☐

500' PATTERN TOUCH & GO LANDINGS

TRAFFIC INTERVAL	Proper	Short	Long			
VOICE REPORT (WHEELS DOWN)	Yes	No				
DOWNWIND LEG AIRSPEED	80	85	90	95	100	
ALTITUDE	400	450	500	550	600	
TRACK DOWNWIND	Proper Small Corrections	Proper Large Corrections	Wide or Close			
BEGINS APPROACH TURN	Abeam	Early	Late			
APPROACH AIRSPEED	◄ SLOW -15	-10	-5	Proper	+5	+10 +15 FAST ►
CONTROL OF DESCENT	Proper	Erratic				
APPROACH TRACK	Proper	Improper				
ALTITUDE IN STRAIGHT-AWAY	Proper	High	Low			
BEGINS TRANSITION TO LANDING	Approx 30 Ft	High	Low			

MANNER OF TOUCHDOWN

TRACK	Straight	Drifting	Over correcting
ALIGNMENT	Straight		Crabbed
ATTITUDE	3 Pt	Hard 3 Pt	Wheels
BOUNCE	No		Yes
CORRECTION FOR BOUNCE	Proper		Improper
TOUCH DOWN POINT ON RUNWAY	First 1/3		Other
STICK ON ROLLOUT (FULL BACK INTO WIND IF NEEDED)	Yes		No
DIRECTIONAL CONTROL (ROLLOUT & TAKEOFF)	Small Deviations		Swerve
NOSE ATTITUDE LEAVING DECK	Proper	High	Low
AIRSPEED IN CLIMB	SLOW ◄ -15 -10 -5	Proper	+5 +10 +15 ► FAST
USE OF TRIM FOR ENTIRE PATTERN	Good	Fair	Poor

TRAFFIC ENTRY AND PATTERN AT HOME FIELD

						COMMENTS
AIR DISCIPLINE ON ENTRY TO RESTRICTED AREA TO LET DOWN POINT	Follows course rules		Minor infractions of course rules		Serious or dangerous infractions of course rules	
SELECTS BEST TANK IN STRAIGHTAWAY ZONE	Checks tank and selects best				Apparently forgets or ignores	
AIRSPEED IN LETDOWN	95	100	105	110	115	
	600 PATTERN AT 90 KTS.					
ALTITUDE CONTROL	500	550	600	650	700	
AIRSPEED CONTROL	80	85	90	95	100	
½ FLAPS IF GEORGE FLAG FLYING	Yes		No			
REPORTS CHECK-OFF LIST	Gives voice report				Forgets	
TRACKS ACCORDING TO RULES (From letdown point to final approach)	Maintains proper track		Track deviates slightly		Track deviates excessively	

APPROACH AND FINAL LANDING AT HOME FIELD

WHEELS DOWN AND LOCKED	Yes	No	
FLAPS	Proper	Improper	
APPROACH A/S	SLOW ← → FAST -15 -10 -5 Proper +5 +10 +15		
CONTROL OF DESCENT	Proper	Erratic	
APPROACH TRACK	Proper	Improper	
ALTITUDE IN STRAIGHT-AWAY	Proper	High	Low
BEGINS TRANSITION TO LANDING	Approx 30'	High	Low

MANNER OF TOUCHDOWN

TRACK	Straight	Drifting	Over-correcting
ALIGNMENT	Straight		Crabbed
ATTITUDE	3 point	Hard 3 pt.	Wheels
BOUNCE	No		Yes
CORRECTIONS FOR BOUNCE	Proper		Improper
TOUCH-DOWN POINT ON RUNWAY	First 3rd		Other
STICK ON ROLLOUT	FULL BACK INTO WIND IF NEEDED Yes		No
DIRECTIONAL CONTROL ON ROLLOUT	Small Deviations		Swerve

WEATHER CONDITIONS

Turbulence	Very Smooth	Moderately Rough	Very Rough
Distinctness of Horizon	Clear & Sharp	Moderate Haze	No visible Horizon

Degree of cross wind at cross wind field

Velocity ______

PLANNING

- [ ] Student appears to plan well ahead at all times
- [ ] Sometimes shows poor planning
- [ ] Often shows poor planning

COORDINATION

- [ ] Student generally flies airplane smoothly in balanced flight
- [ ] Student sometimes rough or out of balanced flight.
- [ ] Student very rough or grossly uncoordinated

ALERTNESS FOR OTHER TRAFFIC

- [ ] Student continually alert, seldom fails to look before turning, etc.
- [ ] Student sometimes lax, but maintains a fairly good lookout.
- [ ] Student dangerously lax, keeps head in cockpit, often fails to look before turning, etc.

USE OF TRIM TABS THROUGHOUT HOP

Consistent proper use of tabs.

Slightly improper use of tabs.

Grossly improper use of tabs (includes failure to use)

INITIATIVE IN MINOR EMERGENCIES

(such as taking waveoffs, adding power when needed, etc.)

Unobserved

Fair

Good

Poor

EMOTIONAL TENSION

Student seems alert and attentive without nervousness

Student seems tense or nervous but this does not seriously interfere with his flying

Student tense and nervous to the point of interfering with his flying

AIRSICKNESS

Student did not get sick

Student got sick

To be marked only if student flies a down check:

DO YOU RECOMMEND EXTRA-TIME?

Yes

No

PREDICTION OF SUBSEQUENT PASS OR FAIL

- Student will, in all probability, be successful in getting wings.
- Student a borderline case
- Student will, in all probability, *not* be successful in getting wings.